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# THE BRITISH JOURNAL

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## TUBERCULOSIS

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### ORIGINAL ARTICLES.

#### A STUDY ON THE LEUCOCYTE COUNT IN PULMONARY TUBERCULOSIS.

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THE gradually increasing and oft conflicting evidence brought forward in connection with the number and morphology of the polymorphonuclear leucocytes in pulmonary tuberculosis led me to make some observations on the blood of patients suffering from this disease, with the remote hope that a further clue to the clinical pathology of the disease might present itself. How far that hope has been realized remains to be seen, but from the results of the blood-examinations detailed below one cannot but conclude that a systemic infection like pulmonary tuberculosis sooner or later makes itself apparent by an alteration in the blood, which up till now has received scant recognition from clinical pathologists and diagnosticians.

It is well known that the number of polymorphonuclear leucocytes is variable in health. According to Gulland and Goodall,<sup>1</sup> digestion leucocytosis is a chronic condition which is ever present with us, the increase reaching its maximum four hours after food has been taken. These observers claim that an increase of 1,000 to 1,500 per cubic millimetre represents the increased leucocyte response to the digestion of food. Reider gives the average increase in health after

<sup>1</sup> Gulland and Goodall: "The Blood," 2nd ed. Edinburgh: W. Green and Sons, Ltd.

the intake of food at 33 per cent. Although it does not follow that a similar physiological increase occurs in disease, one must constantly bear in mind the effect of food on the leucocytes of those who may be convalescent from a disease, or in those who have but a mild infection.

There are other causes of leucocytosis—*e.g.*, pregnancy, parturition, exercise, massage, heat, etc.—but the digestion leucocytosis serves to illustrate the fact that in health there is a variation in the number of leucocytes in the circulating blood.

In certain diseases there is also a variation in the number of leucocytes, although the literature confirming this statement is not very abundant. It is an interesting fact that, although so much attention has been paid by hæmatologists to the physiological variations in the leucocyte count, comparatively little has been devoted to its daily fluctuation in diseased conditions.

In chronic diseases such as pulmonary tuberculosis, Hodgkin's disease, carcinoma of the stomach, etc., there is some evidence to show that a variation in the daily count takes place. Marlin<sup>1</sup> has made some interesting observations on the consecutive leucocyte counts in pulmonary tuberculosis in forty cases. He found that, as a rule, the number of leucocytes was less at night and in the early morning, and that there was a definite fluctuation in most cases. By the use of tables he shows that consecutive counts on patients with mitral disease, rheumatic fever, and pneumonia (after the crisis), are remarkably uniform as compared with those done on patients suffering from pulmonary tuberculosis.

Marlin's work is the fullest account of the phenomenon to be found in the literature of the subject. Beyond the fact that a leucocytosis follows the injection of tuberculin (B.E.), he is at a loss to explain this variation in the number of white cells. Thomson<sup>2</sup> has urged the advisability of a systematic research on what I have termed the "leucocyte swing." In cases of carcinoma of the stomach, myositis ossificans, and Hodgkin's disease, he found a remarkable departure from normal in the number of leucocytes in the blood. He wisely suggests that a series of leucocyte counts made daily over a considerable period of time in various diseases might help to put this remarkable variation on a more firm basis.

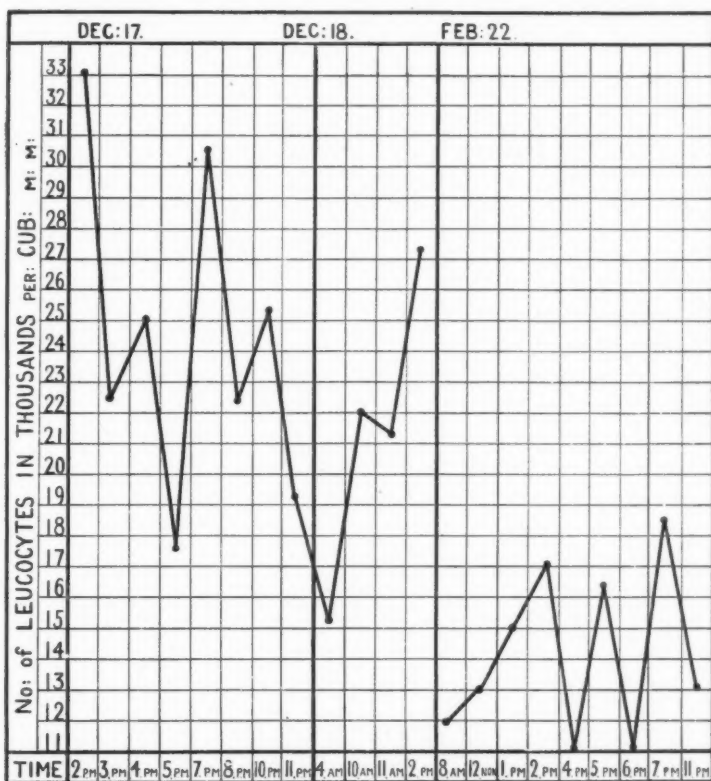
My own investigations have been confined to pulmonary tuberculosis in its various stages and clinical manifestations. The instrument used was the Thoma-Zeiss hæmocytometer, and the dilution

<sup>1</sup> Marlin: "Consecutive Counts in Pulmonary Tuberculosis," *Journal of Clinical Research*, vol. v., No. 2, 1912.

<sup>2</sup> Thomson: "Remarkable Variations in the Leucocytes in Certain Diseases," *British Medical Journal*, May 30, 1914.

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employed 1 in 20; for if the dilution be 1 in 10, one has sometimes a difficulty in making an accurate observation when the cells are numerous. All my examinations were made after treating the cells with a solution composed of glacial acetic acid 1 c.c., distilled water

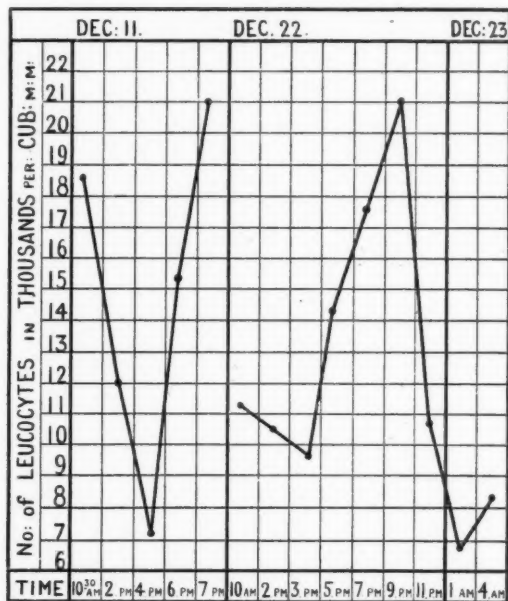


CASE I.: MALE, ÆT. 22.

*Physical Signs.*—On Percussion: Impairment of resonance over right upper lobe. On Auscultation: R. M. increased in intensity over right upper lobe; also posteriorly on right side at the level of seventh dorsal vertebra. Crepitations abundant over right upper lobe.

*Remarks.*—On admission patient was pale and very much emaciated. At first the temperature was very unsteady, running between 98 and 100° F. The pulse-rate did not come below 90, despite the fact that the evening temperature on January 24 was normal. Several examinations of the sputum were made, and on each occasion tubercle bacilli were found. On every slide pus cells were numerous. The patient's general condition improved; on February 24—i.e., two days after the last series of counts was made—there was a great improvement in the local condition in the chest also. On February 29 there was a dramatic close to the case. Hæmoptysis set in, and was so profuse that the patient died in five minutes after the onset of the bleeding.

100 c.c., and methyl green q.s., and one could, with a little care, make a differential count at the same time, for the nuclei are plainly visible in size and contour. This method of making a differential count, however, I did not employ. The entire 400 squares were examined and the total number of white cells enumerated. The counting chamber was now cleaned, and a second drop placed on the slide; a comparison of the second estimation was then made with the first. If these results differed by more than 300, a third examina-



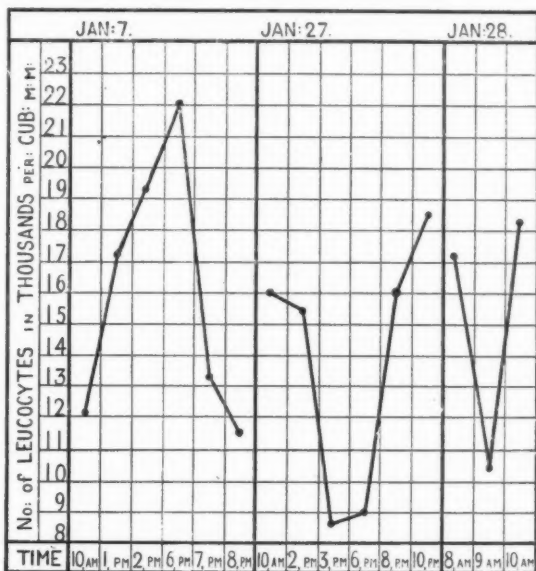
CASE II.: MALE, ÆT. 24.

*Physical Signs.*—On Percussion: Right upper lobe dull anteriorly and posteriorly. On Auscultation: Breath sounds very harsh over both upper lobes, especially the left. Numerous crepitations were heard over both upper lobes anteriorly, and over the left upper lobe posteriorly. There was friction at the apex of the lower lobe on the left side.

*Remarks.*—The temperature swung between 97.8 and 99.4° F. with regularity. Tubercle bacilli were found in the sputum repeatedly; pus cells were very numerous. Small and larger diplococci were innumerable at the second, third, and fourth examinations, and small chains of cocci—presumably streptococci—were observed, as well as many clumps of staphylococci. On patient's discharge the lesion in the chest was noted to be progressive. Died April, 1916.

tion was made of the third drop of diluted blood. The average of the three was then taken. Provided one takes care to get the cells uniformly distributed in the counting chamber, a third examination

is rarely necessary. In the charts which are reproduced, one point is definitely established—viz., that a distinct "leucocyte swing" is a characteristic feature of certain cases of pulmonary tuberculosis, and that the swing bears a certain relation to the morbid processes going on in the system.



CASE III. : MALE,  $\text{ÆT.}$  25.

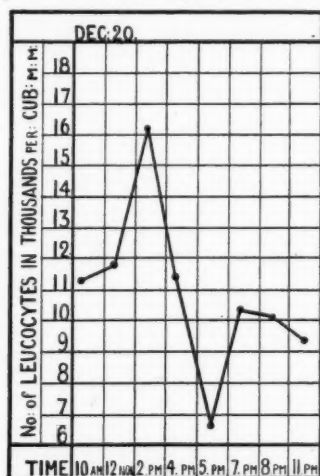
*Physical Signs.*—On Percussion : Both apices lacking in normal resonance, anteriorly and posteriorly. On Auscultation : R.M. intense at both apices. Numerous moist sounds were present at the right apex, and at the left a few scattered crepitations were heard.

*Remarks.*—Patient had a disturbing cough and a fair amount of expectoration. The temperature rose occasionally to 99° F. in the evenings, but no very definite symptoms displayed themselves. On January 2 the patient was allowed up and was given some light exercise. On January 20 he complained of cough and expectoration being more frequent than formerly. The sputum was tinged with blood. Examination on February 3 showed that the disease had made startling progress. The left apex was now infiltrated, and the pulse-rate was 100 to 110 per minute. Sputum examination showed tubercle bacilli in fair numbers, elastic fibres, and abundant pus cells. Staphylococci and small diplococci were found at all examinations. Patient was discharged "worse" on February 15.

#### The Significance of the Leucocyte Count in Pulmonary Tuberculosis.

It has been said that a leucocyte count *per se* is of very little practical value unless it has also been determined which cells participate in bringing the count up to the given value. Such a dictum may be very sound in theory, but one must recognize that once it

has been established that a certain cell is the predominating one in any particular disease, then a total white cell count must be relied upon to give some clue to the content of that cell in the blood. Take, for instance, the ordinary septic infections. From clinical experience we know that the polymorphonuclear leucocytes are the cells which are present in largest numbers, and which constitute, in effect, the leucocytosis. Similarly, in lymphocythæmia, the lymphocytes constitute the cells upon which the high counts of that disease depend.



CASE IV.: MALE, ÆT. 24.

*Physical Signs.*—On Percussion: Both sides of the chest, back, and front; dull to percussion. On Auscultation: R.M. very harsh over entire chest, especially on left side, where whispering pectoriloquy could be heard. There were other definite signs of cavity formation over the upper lobe on the left side. Numerous moist sounds accompanied both inspiration and expiration in both upper lobes.

*Remarks.*—Patient was extremely emaciated. The temperature was, on an average, between 99.4 and 100.4° F. The sputum contained tubercle bacilli in large numbers, the average being fifty or sixty to the field. No secondary organisms could be found either intra- or extra-cellularly. Pus cells were comparatively scarce.

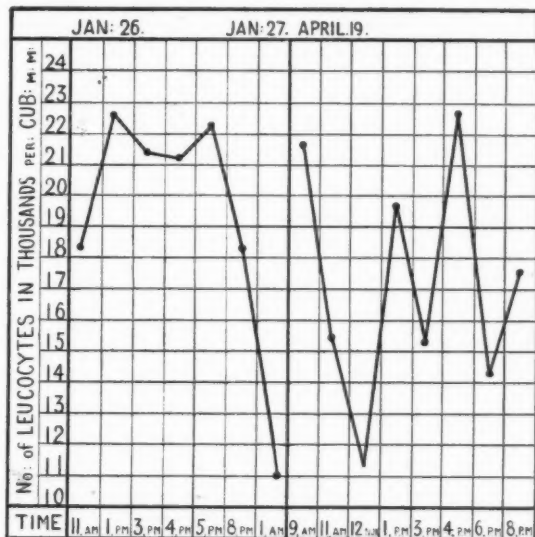
It is far from me to minimize the importance of a differential blood-count. On the contrary, the differential count is of extreme importance as an aid to diagnosis; but from some observations I have made I agree with those who say that, in cases commonly known as cases of "mixed infection," the predominating cell is the polymorphonuclear leucocyte. Klebs,<sup>1</sup> Holmes,<sup>2</sup> Da Costa,<sup>3</sup> Bandelier and

<sup>1</sup> Klebs: "Tuberculosis." London: Appleton and Co., 1909.

<sup>2</sup> Holmes: *Journ. Amer. Med. Assoc.*, vol. xxix., 1897.

<sup>3</sup> Da Costa: "Clinical Hæmatology." Philadelphia: Blakiston's Sons and Co., 1907.

Roepke,<sup>1</sup> Einhorn,<sup>2</sup> and Neubert,<sup>3</sup> are of this opinion, while Gulland and Goodall<sup>4</sup> state that the polymorphonuclear leucocytes in advanced cases of tuberculosis are the result of the septic rather than the tuberculous infection. I have found the polymorph to amount to as much as 90 per cent. of the total leucocyte count in certain cases of pulmonary tuberculosis. In early cases of phthisis showing a leucocyte count within normal limits, the polymorph does not have the same numerical



CASE V.: MALE, ÆT. 38.

*Physical Signs.*—On Percussion: Right side of chest dull to percussion all over; left upper lobe also dull. On Auscultation: Numerous moist sounds were heard over both upper lobes, back and front. Signs of cavity formation were noticed at right apex.

*Remarks.*—Patient's temperature was seldom below 99.6° F. in the evenings. The pulse-rate was about 90 per minute. Sputum examination revealed the presence of tubercle bacilli at every examination; staphylococci, streptococci, and small diplococci, were repeatedly found, and pus cells and elastic tissue fibres were never absent. Patient was in bed most of the time he was a patient in the sanatorium.

value. In fact, in early cases the neutrophile leucocytes are frequently decreased in number at the cost of an increase in the number of lymphocytes.

A careful study of the cases in which consecutive leucocyte counts

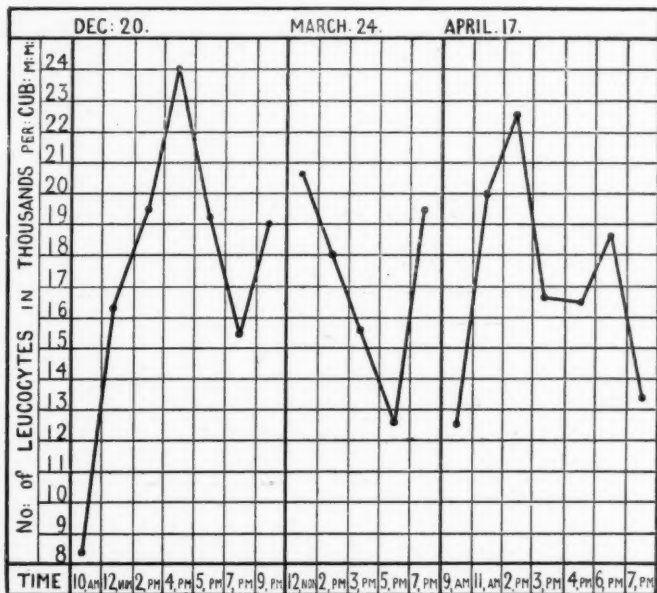
<sup>1</sup> Bandelier and Roepke: "A Clinical System of Tuberculosis." London: Bale, Sons and Danielsson, 1913.

<sup>2</sup> Einhorn: Inaug. Dissert., Berlin, 1884.

<sup>3</sup> Neubert: *St. Petersburger Med. Woch.*, No. 32, 1889.

<sup>4</sup> Gulland and Goodall: "The Blood," 2nd ed., p. 287. Edinburgh: W. Green and Sons, Ltd.

were done brings up several points for consideration, the most important of which is the daily variation in the number of white cells found. By the term "variation" I mean variation in excess of that occurring normally. It requires only a cursory glance through the foregoing charts to show that there is a remarkable tendency for the leucocyte count to vary enormously in certain cases of tuberculosis of the lung. This variation does not, as can be seen, occur in all, but I propose to consider one or two circumstances which, in my opinion, are responsible for such a phenomenon.



CASE VI.: MALE,  $\text{\AA T. 26.}$

*Physical Signs.*—On Percussion: Right upper lobe impaired in resonance; left apex dull. On Auscultation: Harsh breath sound over both upper lobes; a few scattered râles were heard over right upper lobe.

*Remarks.*—The temperature in this case was normal throughout the course of treatment. The pulse-rate rarely came below 90 beats per minute. Patient's chief complaint was shortness of breath on exertion. The sputum showed tubercle bacilli, staphylococci, streptococci, and large diplococci, at every examination, although none of these organisms were very abundant.

Pulmonary tuberculosis being a disease of chronic tendencies involving the respiratory organs, it is obvious that not only must the diseased tissue be exposed at some time or other to contamination with organisms other than the tubercle bacillus, but its very chronicity renders it possible for such extraneous organisms to postpone their

attack, as it were, to a more favourable time. In some cases—in fact, in all cases at first—the tuberculous lesion is a closed one; and if the process of encapsulation of the bacilli be complete, there may be no symptoms or signs whatever to justify the diagnosis of tubercle. In such cases the tubercle bacillus is the only organism concerned in the pathological process. Sooner or later, however, the lesion becomes “open,” and the clinical manifestations are tubercle bacilli in the sputum, some slight bronchitis localized to one apex, and perhaps a slight elevation of the temperature. The presence of tubercle bacilli in the sputum represents an advancement in the pathology of the disease; but there is another element which strikes me as being of undoubted value when found in any quantity in the sputum. I refer to pus cells. By the ordinary method of counter-staining sputum specimens with methylene blue or malachite green, these pus cells can be found in almost every sputum examined. But I doubt very much whether sufficient importance has been attached to their presence. I know of no method whereby it is possible to count the numbers of pus cells in any given sputum, but their presence in enormous numbers in some cases is paramount evidence that they play an important part in the reaction of the body to invading organisms in the lungs and bronchi. Both Lowenstein<sup>1</sup> and Wolff<sup>2</sup> have in the past directed attention to the significance of pus cells in the sputum, but altogether they have attracted comparatively little notice. The rôle of the pus cell in ordinary pyogenic infection is no longer a subject of contention. We now know that a pus cell represents a dead piece of protoplasm the victim of direct organismal attack, or indirect, by means of toxins. Further, the presence of pus in any quantity signifies the presence of pus-forming organisms; and when the tubercle bacillus is found in association with pus cells in large numbers, one must reflect on the term “non-pyogenic” as applied to the Koch bacillus. From microscopical sections from tuberculous tissues, we have seen that the polymorphonuclear leucocyte plays a very inferior part in the construction of the tubercle in its earliest conception. If, however, the tubercle erodes its way into a bronchus, or even if it comes into communication with the inspired air through the medium of alveolar tissue, the result will be the same—namely, contamination with other organisms. The discharge from even a very small tuberculous lesion will excite a local inflammatory process by virtue of the irritation which it, as foreign matter, produces. Incidentally this will lead to a weakening of the tissue—a bronchiole it may be—and a bronchiolitis is thus

<sup>1</sup> Lowenstein: “Beitrag. z. Histologie d. tuberkulösen Auswurfes,” *Zeitsch. f. Tuberk.*, Leipzig, x. 47.

<sup>2</sup> Wolff, quoted by Klebs in “Tuberculosis.” New York and London: Appleton and Co.

produced, which may manifest itself clinically in slight cough and expectoration, even when no physical signs in the chest are to be observed. One might conclude, *a priori*, that an advancing lesion of this nature, which includes alveolitis, bronchiolitis, and bronchitis, according to the situation of the lesion, would evidence itself in ways other than by physical signs in the chest alone. In those cases where an elevation of temperature complicates the tuberculous process, we have been in the habit of ascribing the former vaguely to "mixed infection," even when it has been impossible to find the organism or organisms other than the tubercle bacillus responsible for the condition. The researches of Inman<sup>1</sup> have proved conclusively that it is impossible, by methods at present at our disposal, to tell whether "mixed infection" is absent. In many cases we can definitely say that it is present, but the mere fact that a normal temperature, and it may be a normal pulse-rate, characterizes a case is not sufficient to exclude a mixed infection. With this view many writers, including Ortnier,<sup>2</sup> agree. The latter lays particular stress on the distinction between the tuberculous and the pneumonic processes going on in the pulmonary tissues; they are different histologically as well as etiologically. The pneumonic processes, he says, so common in pulmonary tuberculosis are the result of the activity of the *Micrococcus pneumoniae*, the tubercles of that of the tubercle bacillus. Riviere and Morland define a mixed infection as follows: "For a mixed infection, the two germs must be present, not merely at the same time, but also in the same place, and a mixed infection in phthisis is one in which the tubercular tissue becomes secondarily the settling-ground of other organisms." As these authors themselves say, it is a matter of considerable difficulty to accept this definition, for an organism does not necessarily require to be in the tubercular tissue in order to make its presence felt. The definition is therefore open to argument, and cannot be said to represent the case. Bearing in mind the frequency with which phthisis follows chronic or even acute bronchitis, pneumonia, and influenza, the association of other organisms with the tubercle bacillus is not to be wondered at. Of course, it does not follow that these organisms are always virulent, but my contention is that they *do* make their presence felt much more commonly than is observed. We are familiar with the havoc played by other organisms—the staphylococcus and the streptococcus particularly—in lupus, and in "cold" abscesses which have been opened and left unheeded. What holds true of lupus, *mutatis mutandis*, is true of every tuberculous affection to which microbes can gain access (A. E. Wright).<sup>3</sup>

<sup>1</sup> Inman: *Lancet*, vol. clxxxii., p. 876.

<sup>2</sup> Ortnier, quoted by Inman: *Lancet*, 1912, vol. i., p. 975.

<sup>3</sup> Wright (A. E.): "Principles of Vaccine-Therapy," *Journal American Medical Association*, Chicago, xlix. 567.

Besides, it does not follow that an organism like the *Micrococcus catarrhalis*, for example, remains only moderately pathogenic when in symbiosis with other organisms. Prudden's<sup>1</sup> experiments show conclusively that the concurrent action of two distinct pathogenic organisms may result in a considerable modification of the lesion which either could produce alone. Von Korchynski<sup>2</sup> has gone farther, and proved that the poison of the tubercle bacillus increases the virulence of some organisms—e.g., *B. coli*, streptococcus, and staphylococcus.

If, now, in the case of pulmonary tuberculosis, we start with the assumption that the tubercle bacillus is not a pus-producing organism in the proper sense of the term "pyogenic," we must find another explanation for the presence of pus cells in such large numbers in so many cases of the phthisical sputa examined. It has been shown that many organisms may be present in conjunction with, or in association with, the tubercle bacillus. Their relative frequency is, however, for the purposes of our argument, of little value, but Hastings,<sup>3</sup> Ortnier,<sup>4</sup> Petroff,<sup>5</sup> Ravenel and Irwin,<sup>6</sup> amongst others, agree that the *Streptococcus pyogenes*, staphylococcus, pneumococcus, *Micrococcus tetragenus*, and the *Micrococcus catarrhalis*, are the most frequent organisms found in association with the tubercle bacillus. The power of some of these organisms to produce pus is undisputed, and it is a very significant fact that most of them belong to the class of true pyogenic organisms. Remembering for a moment that with a case of advanced phthisis with cavity formation, and an open lesion discharging tubercle bacilli, elastic fibres, and connective-tissue fibres, and running a typical hectic fever, we are in possession of a typical case of mixed infection, we must inquire into the blood-picture to see if any help can be obtained therefrom, or if any parallel can be drawn between the nature of the case in question and the leucocyte count.

Reference to Cases I., II. and III. will show that the amount of leucocyte swing is considerable, reaching as much as 22,000, and falling as low as 8,600 in Case III. On the other hand, in Case IV., where there was cavity formation, and a temperature of 100.4° F.

<sup>1</sup> Prudden: "Concurrent Infection and the Formation of Cavities in Acute Pulmonary Tuberculosis," *New York Med. Journ.*, lx. 7.

<sup>2</sup> Von Korchynski: "Ueber f. Einfluss d. Tuberkelbazillengifte auf Wachstum u. Giftigkeit anderer Bakterien speciell des *Bact. Coli Comm.*," *Wien. Klin. Wochenschr.*, xviii. 29-34.

<sup>3</sup> Hastings: Unpublished thesis quoted by Gerald Webb in Klebs' "Tuberculosis."

<sup>4</sup> Ortnier: *Lancet*, vol. clxxxii., p. 876 (quoted by Inman).

<sup>5</sup> Petroff: "L'Infection mixte dans la tuberculose Chirurgicale," *Annales de l'Inst. Pasteur*, 1904, xviii. 502.

<sup>6</sup> Ravenel and Irwin: "Studies in Mixed Infection in Tuberculosis," *Trans. Nat. Assoc. for Study, and Prevent. of Tuberc.* Lancaster, Pa., U.S.A.: New Era Printing Company, 1905.

on the day of examination, the highest leucocyte count obtained was only 16,200; all the other counts were well within normal limits. In this case also, although tubercle bacilli were found repeatedly, no other organisms were ever noted, which of course does not signify that they were absent; and I have noted particularly that pus cells were comparatively scarce. From my experience of cases like this one, I can endorse the views of those who dissent from Stein and Erbmann,<sup>1</sup> who have maintained that the absence of leucocytosis excludes cases with cavity formation. Undoubtedly, the beginning of cavity formation is the beginning of a pneumonic process, with ultimate expectoration of the necrotic tissue. The leucocytosis in some cases is certainly associated with the presence of other organisms. Once the cavity is established, however, repair may be complete and very few secondary organisms found, provided the case shows any signs of arrest. It is in such cases that a leucocytosis need not necessarily accompany cavity formation. This theory is in keeping, I have noted, with that set forth by Kjer-Petersen<sup>2</sup> in 1906.

In Case I., on the other hand, which is in many ways the most interesting in the series, it is to be noted—

1. The temperature was not hectic; it never reached more than 98.8° F.

2. The patient's general condition was, to all appearances, improving.

3. There was also an improvement in the physical signs in the chest.

4. There was no cavity formation.

The only points which suggested themselves to me that this patient was not altogether free from danger were—

1. The accelerated pulse-rate.

2. The presence in the sputum of pus cells in large numbers, and tubercle bacilli.

3. The leucocytosis, never below 10,000 per cubic millimetre.

Here, then, are cases which vary widely in respect of physical signs in the chest, and which present features of more than usual interest. Is it possible to reconcile the blood-findings with the physical signs? Briefly put, it appears as if the leucocyte count bears a definite relationship to the acuteness of the process, and the acuteness of the process, in turn, has a more or less intimate connection with the presence of organisms other than the tubercle bacillus. The consensus of opinion is in favour of this view. Thus, Grawitz<sup>3</sup>

<sup>1</sup> Stein and Erbmann: "Zurfrage d. Leukocytose bei Tub. Processen," *Deutsches Arch. f. Klin. Med.*, Leipzig, lvi. 323.

<sup>2</sup> Kjer-Petersen: "Die numerischen Verhältnisse der Leukocyten bei Lungentuberkulose beitr. z. Klinik d. Tuberk.," Würzburg, 1906.

<sup>3</sup> Grawitz: "Ueber die Einwirkung des Hohenklimas auf die Zusammensetzung des Blutes," *Klin. Wochens.*, xxxii. 713.

maintains that in Stage 1 the number of leucocytes is unaltered; in Stage 2 they are moderately increased, and in Stage 3, with fever, the leucocytes are much increased. Ullom and Craig<sup>1</sup> found them to average 10,285 in the first stage, 12,772 in the second stage, and 14,041 in the third stage.

In several of my cases there was no reason to suppose that the patients had any active disease as judged by the physical signs in the chest, the pulse-rate, and the temperature; and in these same cases one can hardly doubt that phthisis existed. The diagnosis in these cases was that of chronic phthisis, or early phthisis in the process of arrest. In these cases one can conclude justly that, although the tuberculous process was still present, the pulse-rate, temperature, and physical signs, pointed to quiescence of the disease. The leucocyte count in these cases was well within normal limit. The sputum examination was either negative for tubercle bacilli, or else it showed very few pus cells or other organisms with tubercle bacilli. We may state, therefore, that in those cases—cases of uncomplicated tuberculous infection—the leucocyte count is normal.

When, however, we come to examine many of the cases, we find that not only is there a leucocytosis, but that the leucocytosis is not constant in the sense that the leucocytosis of pneumonia, or of a moderately severe septic infection, is constant. It is in those cases that there is what I have termed a "leucocyte swing," which is a distinct departure from normal.

In the extreme cases of mixed infection, there is an infection not only by the tubercle bacillus, but also by other organisms. All the organisms present in the diseased focus are in a vascular area, so to speak. Now, the usual explanation given for an abrupt rise in temperature occurring in a tuberculous individual running a hitherto normal temperature is that it is caused by an auto-inoculation. The physiology of an auto-inoculation is, briefly, a carrying away from the tuberculous area of the patient's own tuberculin by means of the blood-stream. If, however, there are products of other organisms to be carried into the blood-stream as well, it follows that the auto-inoculation must be a compound one, composed of the toxins of the organisms present in the diseased tissue. The advanced phthisical case, then, with the lung tissue swarming with streptococci, staphylococci, tubercle bacilli, etc., is merely containing in his chest an incubator for these organisms. No doubt part of the defence of the body in this state is by means of the leucocytes, acting as phagocytic agents or as carriers of complement. But what is the

<sup>1</sup> Ullom and Craig: "Examination of the Blood in Pulmonary Tuberculosis, with Special Reference to Prognosis," Transactions Nat. Assoc. for Study and Prevent. of Tuberculosis, New York, 1. 166.

explanation of the extreme variation in the count which occurs? One can do no more than suggest some possible explanation. The function of the polymorphonuclear leucocyte, despite what is known of its structure and life-history, is far from clear. If we regard it as being a weapon of defence, then we must specify whether it defends by direct or by indirect methods. There are, in other words, two main views as to the function of the cell—firstly, that it is phagocytic; secondly, that it is an important element in the process of immunity. The first view is the one which was held previous to the formation of the hypothesis of immunity elaborated by Ehrlich. In order to fit in with Ehrlich's theory, it was necessary to ascribe to the leucocyte a rôle in the production of immunity and, according to Metchnikoff, the complement of Ehrlich is represented by the alexins, certain chemical substances of the nature of an unstable nucleo-proteid. So far as the phagocytic function is concerned, there is no doubt that the polymorphonuclear leucocyte possesses this power in a marked degree—to some organisms more than to others. It is in relation to the immunizing properties of the polymorphonuclear leucocyte that special interest arises. So intimately, however, is the question of immunity bound up with that of phagocytosis that it is convenient to give several possible causes for the remarkable intermissions in the daily leucocyte counts which interpolate themselves with such regularity in certain cases of tuberculosis of the lungs.

1. *That they are due to REST.* This obviously is not the case; for although the counts tend to be lower during the usual resting hours, in keeping with the diminution in physiological activity, yet one can find a very low count during the daytime, when patients are up and going about. It is the very existence of this low count in the daytime that gives the successive counts their characteristic "swing" when recorded in series. Absolute rest does, however, tend to reduce the total number of cells by reducing the working of all the body processes, of which the heart's action is the most important, to a minimum.

2. *That they are due to BONE-MARROW EXHAUSTION.* If this were the case, one would expect that one low count would be followed by another. So far as the total number of cells is concerned, this is not the case. At present we are considering the quantitative rather than the qualitative change in the cells, and from the observations I have recorded we are not entitled to say that a temporary diminution in the total white cell count is indicative of marrow exhaustion. But an interesting point presents itself here. Suppose, for example, we reconsider Case I. The counts taken on December 17 represent acute processes which are being responded to by leucocytosis. The counts taken on February 22, on the other hand, may represent one of two

things—either that the lung disease was becoming less acute, and that a smaller leucocyte response was necessary; or that the bone marrow was becoming exhausted. One is hardly in a position to say that a leucocyte count of 18,500 denotes marrow exhaustion from a quantitative point of view. It is not at all uncommon to find a very poor qualitative picture with a leucocyte count of 12,000 to 20,000 cells per cubic millimetre. By the term "qualitative" picture I mean a differential leucocyte count, not only of the white cells *en masse*, but of the polymorphonuclear cells in particular, as has been estimated by the methods of Arneth<sup>1</sup> and Schilling.<sup>2</sup> By making use of these combined methods of estimating the value of the polymorphs, one is enabled to say definitely whether a given leucocyte count represents a healthy reaction on the part of the bone marrow to infection, or whether the apparently satisfactory quantitative reaction is in reality a bad qualitative one, indicating, therefore, a failure on the part of the bone marrow to satisfy the demands of the body. It has been proved definitely by Andrewes<sup>3</sup> and Cadbury<sup>4</sup> that, in cases of wasting diseases—*e.g.*, tuberculosis—the bone marrow itself was in a condition of mucoid transformation, even when the leucocyte count was as high as 100,000 per cubic millimetre.

The outcome of this argument, then, is that the comparatively low counts which present themselves daily in some cases do not *per se* represent an exhaustion of the resources of the bone marrow, unless it can be also demonstrated that the cells are qualitatively deficient. In all my investigations on the leucocyte counts in patients suffering from pulmonary tuberculosis, I have not had a case showing constant leucopænia. In some respects I have been surprised at this, for in many cases the daily output of white cells is five times greater than that occurring normally, and this output has been kept up for weeks at a time. It is not fair to assume that the hæmopoietic tissues can keep up the necessary quality as well as the requisite quantity.

3. *That they are due to periodical intermissions of substances acting on them by a process of NEGATIVE CHEMIOTAXIS.* It is only by supposing that some such substances exist that the periodical remissions of the leucocytes can be explained with any degree of satisfaction. In the light of our present knowledge, we can state two facts with certainty: firstly, pyogenic organisms have the power of producing

<sup>1</sup> Arneth: "Die Neutrophilen Leukozyten b. Infektionskrankheiten," *Deut. Med. Woch.*, 1904, xvk. 54; and other papers.

<sup>2</sup> Schilling: "Fol. Hæmat.," vi. 322 (1908).

<sup>3</sup> Andrewes: "The Behaviour of the Leucocytes in Infection and Immunity," Croonian Lecture. *Lancet*, vol. ii., 1910.

<sup>4</sup> Cadbury: "Marrow Studies in Tuberculosis," Fifth Annual Report of the Henry Phipps Institute. *Lancet*, p. 87, vol. ii., 1910.

a leucocytosis when present in the body in requisite number, or when sufficiently virulent; secondly, tubercle bacilli do not possess this property. Muir<sup>1</sup> was among the first to show that a leucocytosis of inflammatory origin was synonymous with a leucoblastic reaction in the bone marrow. Andrewes,<sup>2</sup> on the other hand, failed to get any leucoblastic response after infection with the tubercle bacillus, the bone marrow appearing normal in all respects.

In the extreme case of miliary tuberculosis, where the body tissues are inundated with tubercle bacilli or their toxins, the existing condition in the blood is one of leucopænia, a point of special significance in virtue of the fact that in such a case we are dealing with an overwhelming dose of tubercle bacilli and toxins. Now, in those cases of miliary tuberculosis one cannot say that the bone marrow is exhausted, in the sense that it has produced so many polymorphs that it cannot produce more. We must, as in the case of typhoid infection, suppose that there exists in the circulation a substance inhibiting the production of leucocytes. The tuberculo-toxin is, then, an aggressin, but what the exact nature of the aggressin is we do not know. Bail regarded his aggressins as non-toxic substances, but it is only fair to state that others—*e.g.*, Sauerbeck<sup>3</sup>—dissent from this view, and regard negative chemiotaxis as a minor manifestation of toxicity. Andrewes<sup>4</sup> supports my contention in the following: "I do not find it illogical to conceive that certain inherent products of the natural bacterial body may have become positively chemiotactic to the leucocytes—thus explaining the facts of spontaneous phagocytosis—while believing that the more highly specialized parasites have secondarily acquired the power of producing another chemical substance which may keep phagocytosis in abeyance. "In the advanced cases of phthisis—typically cases of mixed infection—the tuberculo-toxin, or aggressin, is also present, but only in conjunction with the toxins of streptococci, staphylococci, pneumococci, etc., which are essentially stimulators of leucocyte production. The balance between the various toxins is never equal, or one other predominates at various times, and in this way the leucocyte swing is maintained, being high when the bone marrow is suitably stimulated and being low when the tuberculo-toxin is acting. From such an hypothesis it is easy to explain why the extent of the lesion may be of negligible value in giving a prognosis in a given case. It may be

<sup>1</sup> Muir: *B.M.J.*, 1898, vol. ii., p. 604; also *Trans. Path. Soc. Lond.*, 1902, vol. liii., p. 379.

<sup>2</sup> Andrewes: "The Behaviour of the Leucocytes in Infection and Immunity," Croonian Lecture. *Lancet*, vol. ii., 1910.

<sup>3</sup> Sauerbeck, quoted by Hiss and Zinsser.

<sup>4</sup> Andrewes: "The Behaviour of the Leucocytes in Infection and Immunity," Croonian Lecture. *Lancet*, vol. ii., 1910.

pertinently asked at this juncture: "What happens to the surplus of leucocytes when low counts interpolate themselves between high ones?"

Experiments done by Ellerman and Erlandsen of Copenhagen<sup>1</sup> show that, in health, the assumption of the erect posture, or the sudden change to the recumbent position from the erect posture, may be associated with an equally sudden change in the number of leucocytes—that is, there is a static leucocyte reaction. The explanation which they offer for the occurrence of this phenomenon is that the increased rapidity of the heart's action, and the greater velocity of the blood-stream produced in consequence, forces the leucocytes from the deeper vessels into the superficial capillaries. In phthisis and more particularly in advanced phthisis the heart's action is extremely uncertain as regards rate. The intoxication of the system by the offending organisms and their toxins is the cause of the accelerated pulse-rate, and the same toxins are carried throughout the body at an increased velocity to act on the leucopoietic organs. The stimulation of leucocyte production has been proved definitely to be a result of pyogenic organisms, but whether the inhibition of leucocyte production is worked from the bone marrow as a centre is extremely problematical. The researches of Goldscheider and Jacob,<sup>2</sup> and of Bruce,<sup>3</sup> and of Andrewes,<sup>4</sup> go to show that, in cases of rapid decrease in the leucocyte content of the blood, the cells are "held up in the lung, screened off, as it were, by the pulmonary capillaries." Why the leucocytes should go to the pulmonary capillaries is, again, a matter for speculation. To me there appear to be two explanations: firstly, for oxygenation, the view supported by Andrewes; and, secondly, for the combined purpose of phagocytosis and distribution of complement. In connection with the second theory, I beg to submit that so long as the leucocyte count remains normal in every respect—and by that I mean quantitatively as well as qualitatively—the leucocytes are carrying sufficient complement for the reaction between antigen and antibody to take place. The disease may progress in the lung and yet the balance between antibody and antigen may be quite good, the only difference being a qualitative change in the leucocytes, as can be estimated by Arneith's method. With, however, the onset of any complication, such as pneumonia, secondary infection, or bronchitis, there is a demand for complement of two, or it may be more, kinds, according to the nature of the infection.

<sup>1</sup> Ellerman and Erlandsen: *Archiv für Experimentelle Pathologie und Pharmacologie*, December, 1910.

<sup>2</sup> Goldscheider and Jacob: quoted by Klebs (*loc. cit.*).

<sup>3</sup> Bruce: *Proceedings of the Royal Society*, vol. lv., 1894.

<sup>4</sup> Andrewes: "The Behaviour of the Leucocytes in Infection and Immunity," Croonian Lecture, *Lancet*, vol. ii., 1910.

In such cases the bone marrow may or may not be able to supply the demand thus made upon it, and degeneration sets in—a degeneration which affects the polymorphs morphologically in most cases. If, in spite of the intensity of the infection, the leucocytes respond, the patient will overcome his infection simply because his immunity has been sufficient in virtue of his successful qualitative polymorph response—qualitative because increased leucocytosis *per se* is not necessarily associated with increase of complement. In some cases a successful outcome will result from a leucocytosis of 14,000, and in others it may require 30,000. The ebb of the leucocyte swing means, therefore, that the leucocytes are required on another front—namely, the lung—in order to carry out the two processes upon which life depends: viz., immunity and phagocytosis.

4. *That they are due to ANAPHYLACTIC PHENOMENA.* There has been a considerable amount of work done recently on the relation of anaphylaxis to tuberculosis. By some it has been said that the reaction which sometimes follows the injection of tuberculin is an anaphylactic phenomenon. Certain it is that the clinical symptoms of anaphylactic shock in no way resemble the clinical symptoms following tuberculin injection; in the former the temperature is markedly lowered, some dyspnoea results, and the end may be in convulsions; in the latter the temperature is raised, and there is no choking or severe dyspnoea such as is observed in the former. Again, whilst anaphylaxis can be passively transferred from one animal to another, no such phenomenon has ever been known to occur in connection with tubercular sensitiveness (Friedemann,<sup>1</sup> Roepke,<sup>2</sup> etc.). The researches of Rosenau and Anderson, quoted by Hiss and Zinsser,<sup>3</sup> have demonstrated also that anaphylaxis may be inherited, a claim which cannot be extended with certainty to tubercular sensitiveness. On the other hand, it has been found that the condition of anaphylaxis is associated with a disappearance of complement from the serum; and if, as has been taught by Metchnikoff and others, complement is derived from the leucocytes, then one would expect the clinical condition of anaphylaxis to be associated with a diminution in the number of leucocytes. Andrewes has actually observed the initial leucopenia in animals suffering from anaphylaxis, and concludes that "leucopenia is an integral part of the phenomenon of anaphylaxis." Da Costa<sup>4</sup> divides the blood-phenomenon resulting after the injection

<sup>1</sup> Friedemann: "Ueberpassive Ueberempfindlichkeit," *Munch. Med. Woch.*, liv., 1907.

<sup>2</sup> Roepke: "Untersuchungen über die Diagnose der menschlichen Tuberkulose mittelst Anaphylaxie," *Brauer's Beit. zur Klin. der Tuberk.*, xiv, 147, 1909.

<sup>3</sup> Hiss and Zinsser: "A Textbook of Bacteriology," New York and London: Appleton and Co., 1912.

<sup>4</sup> Da Costa: "Clinical Hæmatology," p. 239. Philadelphia: Blakiston's Sons and Co., 1907.

of bacteria, toxins, albumins, etc., into animals, into hypoleucocytosis and hyperleucocytosis. The former is the first result of the foreign matter introduced, and is represented by a diminution in the number of leucocytes in the peripheral blood. The latter is manifested by an increase in the number of white cells, and follows the hypoleucocytosis. Both the hypo- and the hyper-leucocytosis are dependent on the intensity of the irritant acting. To quote Da Costa: "If the irritant is slight, the repellent influence is feeble, and the consequent cellular increase is inconspicuous. . . . If the effects of the irritant are severe, both the repellent and the attractive stages are promptly excited and markedly developed, and a general increase in the number of leucocytes through the whole circulatory system promptly results. . . . It sometimes happens that the attractive influence of the chemiotactic principle predominates over its repellent action, in which case the stage of hyperleucocytosis may develop without the initial stage of hyperleucocytosis. Clinically, the preliminary decrease is practically never observed, perhaps partly for the reason last given, but also in a large measure because the repellent action of the irritant has passed off by the time the disease has developed into a clinical picture." The parallel between this hypo- and hyper-leucocytosis, and the negative and the positive phases of Wright, which follow tuberculinization, is apparent.

Applying what has gone before to the blood-findings in cases of pulmonary tuberculosis, the low counts would represent the stage of hypoleucocytosis, and the high ones the stage of hyperleucocytosis. It is impossible for one to dogmatize further than this. Whether this phenomenon is anaphylactic or not matters very little; the symptoms displayed by patients with low counts do not correspond to the symptoms shown by patients suffering from anaphylaxis. Indeed, so far as I have been able to make out, the patient's condition is absolutely no indication to the leucocyte count. Taking everything into consideration, there appears to be very little in common between the response to inoculation, active or passive, in the tuberculous subject, and anaphylaxis. The fact that one phase in the clinical pathology of the one resembles a similar phase in the clinical pathology of the other is no reason for considering the phenomena identical. As we have seen, there are many points of dissimilarity between the two.

#### General Conclusions.

What has gone before does not presume to exhaust the discussion of the rôle of the polymorphonuclear leucocyte in the clinical pathology of pulmonary tuberculosis. The question appears to be one of much greater magnitude. My intentions have been to show that in the

polymorphonuclear leucocytes we have tissue cells which are definitely inimicable to the great majority of the organisms which infect the respiratory passages secondarily, and to which we can attribute much of the damage done in the pulmonary and bronchial substance. Let us make full use of the function of these white cells as a guide to diagnosis, prognosis, and treatment. Evolution works slowly. Who can say but that the same cells or some other cells—*e.g.*, the large mononuclears—may be gradually educating themselves to respond “to the chemical aroma” of the tubercle bacillus, just as they have learned in the past to deal with the lesser complex foes of the human body? As matters are at present I conclude with a quotation from Bushnell: “An objective proof that a toxic absorption is present in a degree which constitutes a tax on the resistance of the afebrile patient is one of the great desiderata in the treatment of pulmonary tuberculosis.”

## THE ECONOMIC ASSISTANCE OF THE TUBERCULOSIS PATIENT.

### A NOTE ON THE TREATMENT OF TUBERCULOUS CASES IN THE COUNTY OF CORNWALL.

BY CHARLES ROPER,

M.D., D.P.H.,

Tuberculosis Officer for the County of Cornwall.

THE symposium of opinions which appeared in a recent issue of this Journal<sup>1</sup> regarding the directions in which those engaged in the anti-tuberculosis campaign should concentrate their efforts under present conditions has attracted widespread interest amongst Tuberculosis Officers. Granted that segregation of infective cases is logically the most desirable of all measures, many circumstances render comprehensive steps in this direction impossible, at any rate at the present time. Most Tuberculosis Officers find themselves working partly developed schemes, to which appropriate extension is denied, owing to depleted staffs and reduced funds.

A short note on the tuberculosis problem, as evidenced in the so-called “Delectable Duchy,” may not be without interest and value. The unenviable position of Cornwall as regards Tuberculosis may be seen by reference to the annual returns of the Registrar-

<sup>1</sup> See BRITISH JOURNAL OF TUBERCULOSIS, January, 1916.

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General; it is even more strikingly shown, as regards its insured population, by the following table :

County.	Number of Insured Persons on Count of Register, October 1, 1915.	Number of Persons receiving Domiciliary Treatment in December, 1915.
Cornwall ...	86,681	310 (= 3.576 per 1,000).
Dorset		
Hampshire } ...	289,408	296 (= 1.02 per 1,000).
Wiltshire }		

These figures do not include patients receiving sanatorium or dispensary treatment. The total number of cases for Cornwall includes 275 insured persons and 35 dependents: details are not given by the other counties. The majority of dependents in Cornwall, and probably also in other counties, receive dispensary treatment.

The County Sanatorium is not yet built; as a result, persons for whom sanatorium treatment is recommended have to be sent out of their county, a procedure which has many disadvantages. The proportion of cases receiving sanatorium treatment would appear to be rather lower in Cornwall than in some other areas; on the other hand, the results of treatment regarded solely from the criterion of "return to work" compare very favourably with the figures from these other areas, and a further analysis seems to show that with the same criterion domiciliary treatment produces better results than the sanatorium. My figures are necessarily small, and they are purposely confined to two of the county dispensary districts where the work during 1915 was but little affected as regards visiting, supervision, etc., by various conditions arising through the war.

Cases of pulmonary and other tuberculosis when *first seen* are roughly classified into—

- A. Apparently hopeless.
- B. Advanced or chronic; temporary improvement only appears possible.
- C. Comparatively hopeful, for prolonged or permanent arrest.
- D. { Doubtful cases, under observation;  
Stigmata;  
Cases other than tuberculosis.

The cases (272 in number) which came under treatment in these two districts during 1915 are too recent to be of much value for the purposes of this argument, and I therefore confine myself to the two and a half years immediately preceding, which give the following number of cases for consideration :

Year.	Total Number of Cases.	Class of Case.			
		A.	B.	C.	D.
1912 ... ..	12	3	4	5	—
1913 ... ..	155	27	47	68	13
1914 ... ..	140	24	28	68	20

Regrouping these according to a census taken on December 31, 1915, the following figures are obtained :

Total of Classified Cases referred to End of 1914.	Condition on December 31, 1915.			
	Dead.	Left County or otherwise lost sight of.	Still under Treatment.	At Work.
A. 54 ... ..	43 = 80%	2	8 = 14·8%	1 = 2%
B. 79 ... ..	16 = 20%	6	26 = 33%	31 = 39%
C. 141 ... ..	4 = 2·8%	5	16 = 11%	116 = 82%

Judging the social value of the individual by the sole criterion of "return to work," these figures show that within the short period under review, while over 60 per cent. of outlay on treatment is unremunerative in those belonging to class B, less than 20 per cent. is unremunerative in the case of those in class C—always having regard to the fact that those in class B are, opportunities being equal, a far greater menace to the community than are those in class C.

Dispensary treatment, popularly so called, only became available in the two Cornish areas under consideration towards the end of 1914; and if we exclude the cases who received this form of treatment alone, we are left with those patients who received sanatorium treatment and those who were treated right through under domiciliary conditions (clearly none in class A were suitable for sanatorium treatment), and we thus get the following totals for comparison, of those patients coming under treatment between June, 1912, and the end of 1914.

The use of shelters was granted when such appeared desirable (about forty cases), and a weekly grant of 2s. 6d. for extra milk was allowed where it was deemed necessary.

Happily for me, and much more so for the reader, the length of this article is limited by the Editor, so that, even did not reason warn me off, I could not, and I would, enter into the thorny controversy regarding the true value of sanatorium treatment. Personally, I am a strong

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Class.	Treatment provided.	Total Number of Cases.	Condition on December 31, 1915.			
			Dead.	Left County or otherwise lost sight of.	Still under Treatment.	At Work.
B.	Sanatorium Domiciliary	9	5	—	1	3
		65	11	6	18	30
C.	Sanatorium Domiciliary	39	3 <sup>1</sup>	1	4	31
		79	1	2	8	68

advocate of the value of a period at a sanatorium in the treatment of many cases of tuberculosis; but as it is not possible to send all cases to a sanatorium and keep them there until permanent arrest has been effected, since furthermore, on discharge, most of the patients return to the homes where the disease was developed, we have of necessity to turn our attention to dealing with a large proportion of subjects under domiciliary conditions. Though small, the figures that evolve from my analysis of a series of unselected cases would certainly appear to justify the development of domiciliary treatment. This includes provision of shelters, frequent supervision by tactful and competent visitors, a small allowance for milk where necessary, and, if required, the services of a dentist. I venture to think that our experience in Cornwall further suggests that, where expenses have to be cut down, as seems unavoidable during war days, this might be effected temporarily, with the minimum loss of efficiency, by a curtailment of the necessarily much more expensive treatment provided by sanatorium residence.

<sup>1</sup> One man accidentally killed while at work.

## THE TRUDEAU SCHOOL OF TUBERCULOSIS.<sup>1</sup>

By DR. EDWARD R. BALDWIN,

Director of the Trudeau School of Tuberculosis, Saranac Lake, N.Y., U.S.A.

THE anti-tuberculosis campaign in America has made very extensive progress during the last ten years. The publicity methods have resulted in a rapid growth of institutions and agencies of all kinds for the control of the disease. At the same time, there has not been a sufficient number of physicians of experience in tuberculosis to make the institu-

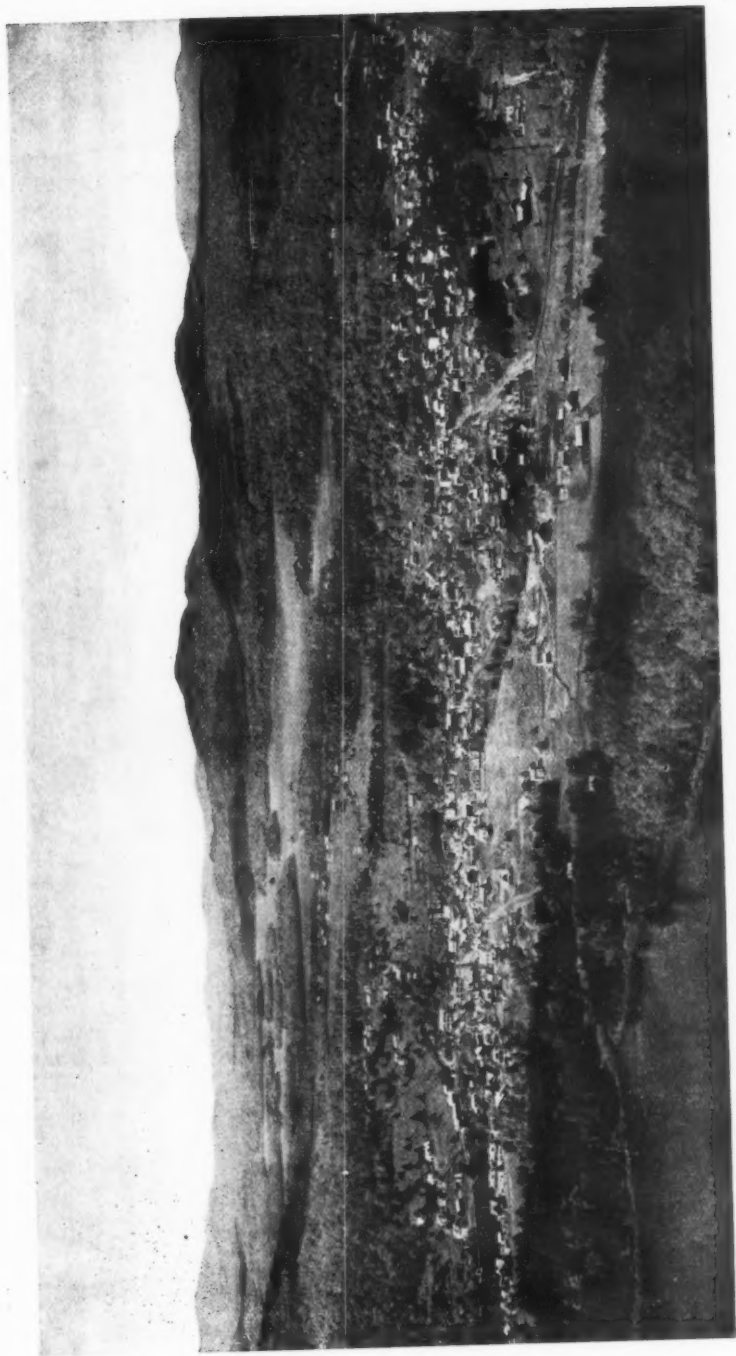


THE RECEPTION HOSPITAL OF THE ADIRONDACK COTTAGE SANATORIUM.

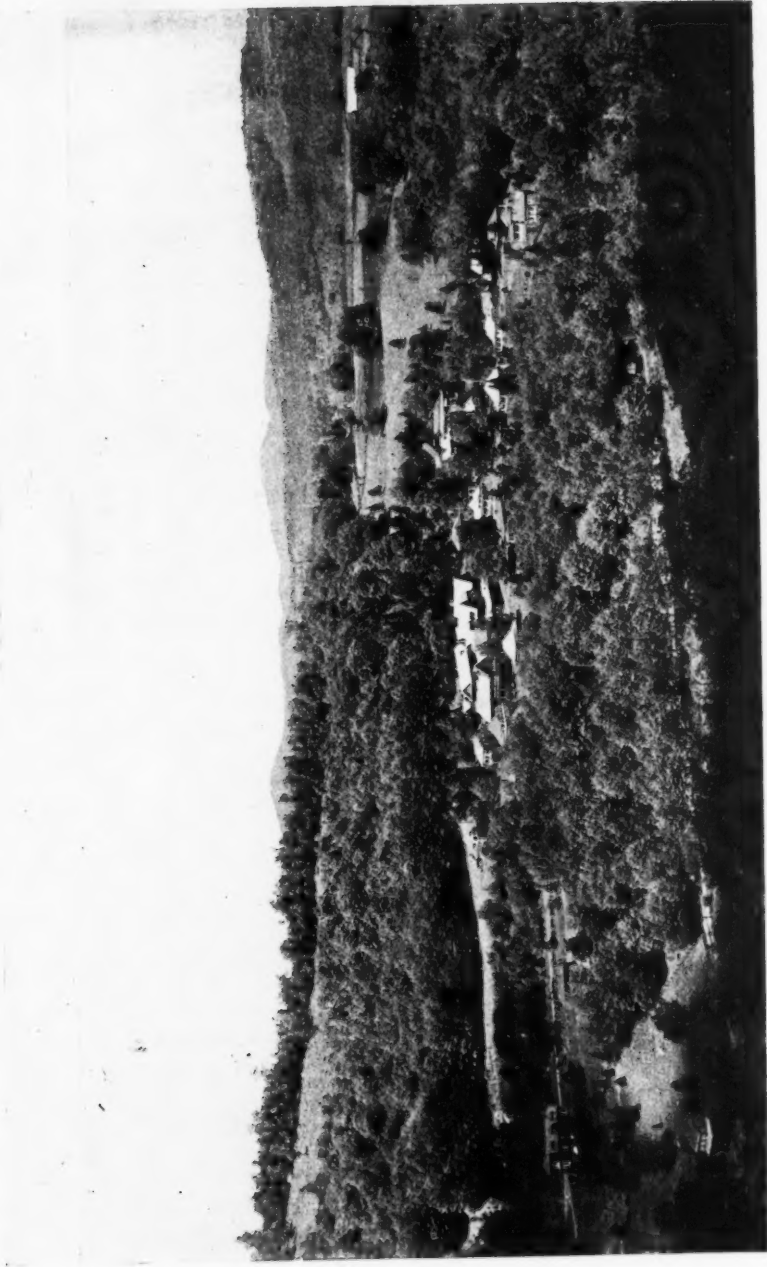
tions as effective as possible. It has always been difficult for physicians not personally victims of the disease to feel a real interest in the study of tuberculosis. It has little appeal to the average man, unless brought into close touch with it in his own family or otherwise.

In view of the difficulties experienced, during the regular course of a medical curriculum in an ordinary medical school, of concentrating attention on one disease, there can be little time given to training in tuberculosis apart from the other necessary studies. To meet the

<sup>1</sup> A memorial sketch of the late Dr. Trudeau, written by Professor Knopf, appeared in the April number of this journal. A notice of Dr. Trudeau's autobiography was published in the July issue of the journal.—EDITOR B.J.T.



A BIRD'S-EYE VIEW OF SARANAC LAKE IN THE ADIRONDACKS.



DISTANT GENERAL VIEW OF THE TRUDEAU SANATORIUM.  
The illustration shows about one-half of the cottages of the colony.

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requirements of medical students and practitioners is the chief object of the Trudeau School of Tuberculosis.



THE SISTERS' HOSPITAL OF THE ADIRONDACK COTTAGE SANATORIUM.



THE MOORE MEMORIAL COTTAGE.

The opportunity for the establishment of such an enterprise was presented to the late lamented Dr. Trudeau a few months prior to his

death. He accepted the responsibility, and his associates have endeavoured to place the advantages for study and research that he created at the disposal of physicians. A six-weeks course for a limited number began in May of the present year, and future courses will follow as the demand may indicate. Scholarships have been established for a few students, and an "Edward L. Trudeau Memorial Foundation" is being solicited in order to perpetuate the work of research and teaching. This memorial fund and the school will be administered by the trustees of the Trudeau Sanatorium, with the aid of an advisory council of well-



THE ADIRONDACK COTTAGE SANATORIUM: THE INTERIOR OF SARANAC LABORATORY.

known authorities. The friends of the anti-tuberculosis cause in America feel that to establish the clinical and laboratory teaching of tuberculosis at Saranac Lake will be the most suitable memorial to Dr. Trudeau. The clinical study will be carried on at the Trudeau Sanatorium, the New York State Sanatorium, and the Stony Wold Sanatorium for Women and Children, and also at the two hospitals for advanced cases, all of which are within a short distance of Saranac Lake. The Saranac Laboratory for Research, recently bequeathed to the Trudeau Sanatorium, together with the clinical laboratories established in the institutions, furnish admirable opportunities for advanced studies in tuberculosis.

The courses of instruction contemplated will cover the most important phases of diagnosis and treatment, and especially all measures and methods relating to sanatorium treatment and management. The laboratory work will deal with the latest and best methods used for the early detection of the disease, and will aim at developing an interest in the study of tuberculosis by the combination of clinical and laboratory activities; this will tend to greater precision and understanding of tuberculosis as met with in the course of public health administration, tuberculosis work proper, and general medical practice. Arrangements have also been made to furnish opportunities for those who desire to study dispensary and social service work in the large cities, by affiliation with several of the larger clinics in New York, Boston, Philadelphia, and Cleveland. It is believed that this enterprise is planned on the right foundation, and has promise of definite value to the cause of combating the scourge of all nations.

## THE CLASSIFICATION OF CASES OF PULMONARY TUBERCULOSIS.

By RODOLPH C. WINGFIELD,

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THE progress that has been made lately in the treatment of tuberculosis will probably be followed after the war by an increased activity in the study of the many problems connected with the disease. Throughout the country large numbers of fairly accurate records are being kept of the different forms of treatment used, and it is important that there should be some standard classification of cases by which the efficacy of the different methods of treatment can be examined. Without some effective classification much valuable information will be wasted, and progress in efficient treatment will be hindered. Further than this, if a standard classification is arranged so that it can be made to record the life-history of the disease in any particular patient, it will be a great boon to the over-worked tuberculosis officer.

### Principles of Classification.

Whatever classification is devised or adopted, one important and absolutely essential condition must be laid down: namely, that it shall only be used for cases of undoubted pulmonary tuberculosis—

that is, cases in which tubercle bacilli have been found in the sputum at some period during the illness. Everyone will agree that the disease is often diagnosable clinically, with fair certainty, before the appearance of bacilli in the expectoration, and also that in many cases the sputum may be free from tubercle bacilli for long periods. But in a classification designed to help comparative study, it is essential that only definite cases should be included; and the finding of the bacillus still remains the only diagnostic proof that no one can deny. It is true that it is in early cases that treatment is most important and most successful; but at the same time everyone is familiar with publication of the reports of new treatments, with their records of high percentage of successes and no failures, and with the disappointing results of the same treatment in one's own hands, results often so disappointing that, on re-reading the report, the question arises, "Were all these cases *definitely* diagnosed and proved to be what they were said to be?" And thus another valuable treatment gets pigeonholed and forgotten because it could not live up to its reputation. It must therefore be reiterated and insisted upon that a classification for comparative study must include only definite cases of pulmonary tuberculosis—namely, those in which tubercle bacilli have been found in the sputum. Having established this as the fundamental basis on which the classification is to be built, it will be well to consider the requirements which must be satisfied. These are as follows:

1. *The classification must be simple.* It should contain as few classes as possible. Any disease can be accurately classified, provided enough latitude is allowed in the number of classes. But after a certain point the value of the classification varies inversely with the number of classes used.

2. *The classification must be independent of the personal equation of the classifier.* That is to say, it must depend on facts, and these facts must be easily obtainable and unarguable. This is the essential requirement.

3. *The classification must be accurate.* A given type of case must fall under one heading, and one only; and having done so, there must be no doubt in the mind of an independent observer as to the nature of the case.

We can now ask, if these are the requirements, how far do the classifications in use at present satisfy them?

#### **Forms of Classification.**

*The Turban-Gerhardt Classification.*—This classification depends almost entirely on an accurate estimation of the amount of tuberculous disease in the lungs—a fact certainly, but not an easily

obtainable or unarguable fact until a post-mortem examination has taken place. Further, it talks of "disease of slight severity," and no accurate or comparative classification can be based on such criteria.

*Philip's Classification.*—In this grouping the three anatomical stages of the Turban-Gerhardt classification are accepted, and denoted by the symbols  $L_1$ ,  $L_2$ ,  $L_3$ ; and the amount of systemic disturbance is used for further subdivision, and is denoted by "S" or "s" according to its severity; and if the severity of the systemic disturbance entirely overshadows the anatomical lesion, the latter is denoted by "l." This classification gives twelve classes. The following table is taken from the published account of Sir R. Philip's scheme :

$L_1$	$L_1S$	$L_1s$	$l_1S$
$L_2$	$L_2S$	$L_2s$	$l_2S$
$L_3$	$L_3S$	$L_3s$	$l_3S$

Sir Robert Philip's classification is undoubtedly the simplest and best available for private use, but it cannot be well used for comparative study, since it involves the Turban-Gerhardt classification, and, further, gives no definite division between slight and severe systemic disturbance.

*The Classification used in the Astor Report.*—In this classification no attention is paid at all to the anatomical extent of the lesion. It is, however, useful for private classification, but it depends on extraordinarily accurate prognosis, and no definite standards are set for subdivision.

*Inman's Classification.*—By this scheme patients are divided into three classes: (1) Resting febrile; (2) ambulant febrile, resting afebrile; (3) ambulant afebrile. And the limit between febrile and afebrile is set at  $99^{\circ}$  F. This is a particularly useful and scientific classification, entirely depending on facts and eliminating the personal equation. But it cannot be accepted as fulfilling all the requirements, since temperature is not always an accurate measure of the severity of the disease. Patients severely ill and dying are often apyrexial, and many patients absolutely incapacitated through the large extent of their anatomical lesion have very slight systemic disturbance. In other words, the classification is not sufficiently minute.

*Walters' Classification.*—Here the anatomical Turban Gerhardt

classification is combined with symbols indicating the amount of systemic disturbance.<sup>1</sup> The degree of the latter is estimated by temperature, pulse-rate, and loss of weight—thus :

	A.	B.			C.		
		a.	b.	c.	a.	b.	c.
Maximum temperature	Not over 38° C. (100·4 F.)	38°1'–38°5" (100°5'–101°3')	Not over 38°	Not over 38°	Over 38°5"	Not over 38°	Not over 38°
Pulse-rate ...	Not over 90	Not over 90	91–120	Not over 90	Not over 120	Over 120	Not over 120
Weight-loss ...	Not over (10 kgr.)	Not over 10 kgr.	Not over 10 kgr.	10–15 kgr. (22–33 lb.)	Not over 15 kgr.	Not over 15 kgr.	Over 15 kgr.

Walters' classification, if the anatomical part is disregarded, is a sound scientific one which can be used for comparative work; but it hardly satisfies requirement No. 3 mentioned above, Class A being far too large. The classification is also rather complicated.

#### A Proposed Classification.

After this general survey of the situation, I should like to suggest a classification which, I hope, will be found a satisfactory one for comparative study. It will, I trust, receive much criticism, and if it is worth anything it should be capable of standing alteration and improvement. To start with, the anatomical extent of the lesion will have to be ignored. It is impossible even for the most experienced to accurately limit the extent of a tuberculous lesion in the lungs, and no two classifiers would agree over a difficult case. Therefore, until we have some accurate means of measuring the areas involved, we cannot use a classification dependent on site or extent of lesion.

The more important feature of the disease—namely, the constitutional or systemic disturbance—must be brought into prominence, and, in my opinion, should be allowed to play the chief part in the classification. This constitutional condition must be accurately defined and measured. The only possible way to do this is by systematic record of the temperature and pulse-rate. It still remains to be decided which is the most reliable. For further subdivision, capacity or incapacity for work can be considered. Such a standard will not at first sight appear to be one which will allow of much accuracy in statistical expression; but after three years' trial I have found it to work well, and to be both accurate and easy.

<sup>1</sup> Walters, F. R.: "Sanatoria for the Tuberculous."

And I am certain that, even for a standard classification, a standard of work is not necessary. A man does most readily that work which he has been trained to do, and it is my experience that the bank clerk with chronic pulmonary tuberculosis finds his work just as trying and just as likely to induce constitutional disturbance as the navy does in regard to his particular form of labour. We can divide all cases into those (1) fit for their work, and (2) those unfit for their work. If a patient is attending his doctor regularly, there is no difficulty in deciding whether he is fit for work or not. If he is fit, he either makes steady improvement or remains *in statu quo*; if he is working but not fit for it, he goes steadily downhill, a fact which it is not difficult to determine. What appears to be at first sight a criterion based on personal opinion will be found to be in practice a hard-and-fast and easily obtained fact. I have used the proposed classification now for three years, and have never known it fail me; nor do I find, when at the end of each quarter I classify my patients according to their fitness or unfitness for work, that there is any doubt into which class they should go.

For the purpose of statistical records I divide cases of pulmonary tuberculosis into four groups: namely, those who during a given period are—(A) Fit for work and remain so; (B) fit for work, but become unfit; (C) unfit for work, but become fit for work; (D) unfit for work and remain so. I suggest that a useful comparative classification would be to combine this classification with an accurate measure of the constitutional condition as found in Inman's classification, and that it could be defined thus.

The condition of a patient suffering from pulmonary tuberculosis (*i.e.*, in whose sputum tubercle bacilli have been found) can be denoted at any given period during the course of the disease by one of the following combination of symbols:

In <sub>1</sub> A	In <sub>1</sub> B	In <sub>1</sub> C	In <sub>1</sub> D
In <sub>2</sub> A	In <sub>2</sub> B	In <sub>2</sub> C	In <sub>2</sub> D
In <sub>3</sub> A	In <sub>3</sub> B	In <sub>3</sub> C	In <sub>3</sub> D

In<sub>1</sub> = Resting febrile.

In<sub>2</sub> = Resting afebrile, ambulant febrile.

In<sub>3</sub> = Ambulant afebrile.

A = Fit for work and remaining so.

B = Fit for work, becoming unfit.

C = Unfit for work, becoming fit.

D = Unfit for work, remaining so.

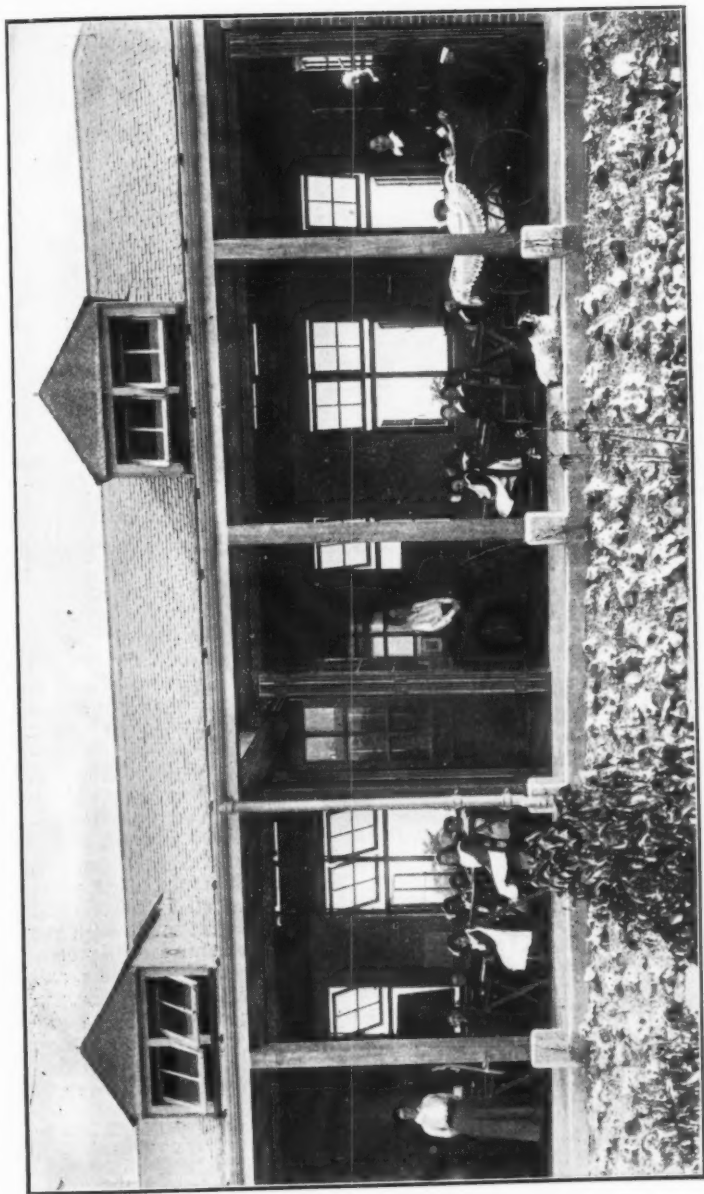
99° F. is taken as the dividing-line between febrile and afebrile, the temperature being taken resting, not less than three-quarters of an hour after work.

## INSTITUTIONS FOR THE TUBERCULOUS.

### THE OPEN-AIR SCHOOL OF THE SANATORIUM OF THE NATIONAL CHILDREN'S HOME AND ORPHANAGE.

THE Sanatorium of the National Children's Home and Orphanage was opened on June 8, 1910,<sup>1</sup> on which occasion Sir Thomas Barlow, Bart., M.D., then President of the Royal College of Physicians, said: "I venture to foretell that from this Sanatorium and its work there shall arise in years to come enlightened effort for poor children in general, which will make their lives more wholesome, more healthy, and more blessed, than anything which we can now realize." The Sanatorium has been recognized as a model institution. It is intended primarily for tuberculous and tuberculously predisposed children of the Home, but during recent years arrangements have been made whereby suitable cases can be admitted through the London County Council and other borough and county authorities. Since the opening of the Sanatorium special attention has been directed to the educational needs of the patients. A new open-air school has been opened this summer. The chief structural features of the school are shown in the accompanying illustration. The architects are Messrs. Holman and Goodrham, and the builders Messrs. Phillips and Blake. In addition to the two classrooms, as shown in the illustration, and which can be thrown into one by the drawing of a movable partition, there are cloakrooms and a teachers' room, with a basement for heating appliance, which supplies the radiators which are placed in the school-rooms for use in winter. It should be added that the Sanatorium and its School are approved by the Board of Education.

<sup>1</sup> A detailed description of the Sanatorium of the National Children's Home and Orphanage, with illustrations and plans, appeared in *THE BRITISH JOURNAL OF TUBERCULOSIS* for October, 1910, vol. iv., No. 4, p. 264. An account of the Sanatorium, with illustrations and plans, will be found in "The Tuberculosis Year Book and Sanatoria Annual," vol. i., 1913-14, p. 342, and also in "The Year Book of Open-Air Schools and Children's Sanatoria," vol. i., 1915, p. 237. Full particulars regarding admission may be obtained on application to the Principal of the National Children's Home and Orphanage, the Rev. William Hodson Smith, C.A., N.C.H.O. Offices, 104-120, City Road, London, E.C.



THE NEW OPEN-AIR SCHOOL OF THE SANATORIUM OF THE NATIONAL CHILDREN'S HOME AND ORPHANAGE,  
HARPENDEN, HERTS.

## NOTICES OF BOOKS.

## CHILD WELFARE.

THE war which is devastating Europe to-day is also productive of results that will be of permanent benefit to the nation. Foremost among these is the increased interest that is taken in child life and in child welfare generally. Whilst the flower of our manhood is being sacrificed in this Armageddon, we have been brought to realize that it is of the highest national importance that greater care be taken of the children among us. Never so much as now do we realize the truth that the children are a nation's greatest asset. This deeper interest in the child is not only due to the fact that in a crisis like the present the value of child life is considerably enhanced from a national standpoint, but it is for the child's own sake that we are doing more in this direction. We have been quickened to a sense of our duty and responsibility in regard to the young and rising generation. The chords of true humanitarian tenderness and Christian sympathy have been touched as never before, and we cannot sin against the children by allowing them to suffer, and by neglecting to give them their rightful opportunity for physical, intellectual, moral, and spiritual development. One of the most recent and beautiful expressions of the insistent call for child betterment is to be found in the publication of *The Child Welfare Annual*, edited by Dr. T. N. Kelynack.<sup>1</sup> This volume is devoted exclusively to a consideration and description of the various agencies and measures for the betterment of the conditions of child life throughout the United Kingdom. For that reason we cordially welcome it. While recommending it to all engaged in work for children, we heartily wish growing success to the praiseworthy object which the editor and his contributors and coadjutors have in view. Dr. Kelynack, who is medical adviser to the National Children's Home and Orphanage, where there are 2,450 children in residence, has for a number of years taken a scientific as well as practical interest in all forms of child welfare work. Moreover, he is in close and constant touch with the leaders of the several societies representing movements for the protection and progress of children of all ages and every rank of society, and is therefore able to speak authoritatively on all subjects relating to infant and child welfare. *The Child Welfare Annual* deals with every phase of child life. It contains information of the first importance, and is an invaluable and an indispensable guide to all whose lot and privilege it is to work among children.

W. HODSON SMITH.

<sup>1</sup> *The Child Welfare Annual*, a companion volume to *The Child*. Edited by T. N. Kelynack, M.D. Pp. xli + 346. London: John Bale, Sons and Danielsson, Ltd. 1916. Price 7s. 6d. net.

## A TREATISE ON PULMONARY TUBERCULOSIS.

Professor Maurice Fishberg has recently issued an elaborate handbook on tuberculosis of the lungs.<sup>1</sup> It is designed to meet the requirements of the general practitioner, but there is much that will be of service to the tuberculosis officer and chest specialist. The author's work is based on long personal clinical experience, amplified by wide study of the literature of the subject. Numerous references are given as footnotes, and the index of authors referred to extends over six pages. All aspects of the subject are thoroughly dealt with, and much space is devoted to domiciliary management, and medicinal, climatic, dietetic, and hygienic treatment. The work is up to date, suggestive, comprehensive, and serviceable. It is probably the most helpful handbook on the subject available for the busy practitioner. There is an excellent chapter on skiagraphy of the chest in phthisis, and reproductions of a series of radiograms are given. Prominence is given to the occurrence of the disease in infancy and childhood. The author is not enthusiastic in regard to the use of tuberculin: "The general practitioner should not use tuberculin at all. He can obtain the same results by the judicious use of drugs, without incurring any risk." A chapter is devoted to the production of artificial pneumothorax, and the opinion is expressed that hardly 5 per cent. of cases of phthisis are suitable for this treatment. The illustrations are numerous and excellent, and the whole volume is handsome in appearance.

## RULES FOR PHTHISICAL PATIENTS.

Dr. Lawrason Brown, of Saranac Lake, has written a manual for the subjects of pulmonary tuberculosis,<sup>2</sup> laying down rules for guidance in the endeavour to secure arrest of the disease. The book is one which should be in the hands of every medical practitioner having to direct the treatment of phthisical cases. The author was associated with the late Dr. Trudeau, and is not only a widely experienced clinical expert and scientific investigator, but has a real understanding of patients' blunders, difficulties, doubts, and essential requirements. The compilation of this handbook has been undertaken with discrimination and far-seeing judgment, and it may be accepted as a reliable guide regarding the fundamental principles necessary to secure a reliable cure. The author justly claims that "the day has come when the physician should look upon the patient not as an ignorant child, but as a human being endowed with more or less mature intelligence; as one, in fact, who has a right to demand an explanation of the way certain effects follow certain causes. The physician of to-day must teach as well as serve; or, better, he must teach in order to serve most intelligently." We commend this sensible and serviceable little volume to all interested in the recovery of the tuberculous.

<sup>1</sup> "Pulmonary Tuberculosis." By Maurice Fishberg, M.D., Clinical Professor of Tuberculosis, New York University and Bellevue Hospital Medical College; Attending Physician, Montefiore Home and Hospital for Chronic Diseases, New York. Pp. xi+639, with 91 engravings and 18 plates. Philadelphia and New York: Lea and Febiger, 706-710, Sansom Street, Philadelphia, and 2, West Forty-fifth Street, New York. 1916. Price \$5.00 net.

<sup>2</sup> "Rules for Recovery from Pulmonary Tuberculosis: A Layman's Handbook of Treatment." By Lawrason Brown, M.D. Second edition, thoroughly revised. Pp. 184. Philadelphia and New York: Lea and Febiger. 1916. Price \$1.25 net.

## A LIFE OF TRUDEAU.

In the July issue of this journal there appeared a review of the fascinating autobiography of the late Dr. Edward Livingston Trudeau, and we are glad to be able to direct attention to a short but worthy biographical sketch of this great tuberculous pioneer of tuberculosis, which has been written with sympathy and understanding by Mr. Stephen Chalmers.<sup>1</sup> The introduction contains a lengthy quotation from Trudeau's last public utterance, "The Value of Optimism in Medicine." Trudeau was a great personality: "What manner of man this was that, sick unto death over forty years ago, could wield from a little laboratory in the wilderness an influence which is materialized in nearly five hundred sanitariums in the western hemisphere for the treatment of consumption by fresh air, rest, and a proper philosophy; what manner of personality this was that, from the prostrate depths of an invalid's chair, could revolutionize the sanitation of business offices where gold seemed life's only worth-while, and of homes where ignorance shrank from pure air and sunshine—this can be explained only by an intimate personal revelation of the remarkable human being that was Edward Livingston Trudeau." This little volume is an all too brief record of the chief events in Trudeau happy but storm-driven, struggling pioneer's life.

## A CONSUMPTIVE'S EXPERIENCES.

A wise physician should always be ready to endeavour to put himself in the patient's place. In dealing with consumptives it is particularly desirable to study the sufferer's point of view. Much can be learnt from a consideration of the personal experiences of tuberculous subjects. We are glad, therefore, to be able to direct attention to an outspoken but highly interesting autobiographical sketch of the thoughts and doings of a courageous American consumptive with real gumption and plenty of grit in his struggles to win "a cure."<sup>2</sup> The book is certainly one which medical practitioners may peruse with profit, and we commend it to the consideration of all those responsible for the organization and administration of sanatoria, or who are called to the responsible duty of advising and helping tuberculous patients.

## I.K. THERAPY.

Spengler's preparation, conveniently designated I.K., although never extensively used in this country, has not been without its enthusiastic supporters. Among them must be ranked Dr. William Barr, who has written an informing monograph in which is explained the nature,

<sup>1</sup> "The Beloved Physician: Edward Livingston Trudeau." By Stephen Chalmers. Pp. xxiii+74. With portrait frontispiece and illustrations. Boston and New York: Houghton Mifflin Company, 4, Park Street, Boston, Mass., U.S.A. 1916. Price \$1 net.

<sup>2</sup> "T. B.: Playing the Lone Game, Consumption." By Thomas Crawford Galbreath, author of "Chasing the Cure in Colorado." Pp. vi+74, with illustrations. New York City: *Journal of the Outdoor Life Publishing Company*, 289, Fourth Avenue. 1915. Price 25 cents.

action, and methods, of employing I.K.<sup>1</sup> Records appear of the author's own clinical experience in regard to its use in 47 cases of pulmonary tuberculosis. Dr. Barr states that he uses tuberculin "almost as extensively" as I.K., and he does not hesitate to claim that "in the treatment of pulmonary tuberculosis I am confident tuberculin will keep its fair share of credit." In the preparation of the brochure the author has drawn extensively on the well-known manuals of Mr. Walter H. Fearis and Dr. W. E. M. Armstrong. Dr. Barr's monograph merits the critical study of tuberculosis officers and medical superintendents of sanatoria. There are 42 temperature charts, but each only extends over a few days, and therefore cannot be considered of much value.

### SÉRUMS, VACCINES, AND TOXINS.

The present-day practitioner of medicine is ever enlarging his armamentarium. Agents scarcely dreamt of in bygone days are now among his most valuable aids to effective treatment. This is particularly true of serums, vaccines, and toxins. Rapid progress is being made in this branch of practical medicine. We therefore gladly welcome a new edition of the admirable handbook which we owe to the enterprise and industry of Drs. W. C. Bosanquet and J. W. H. Eyre.<sup>2</sup> The first edition appeared long ago, and it is six years since the issue of the second edition. All parts have undergone thorough revision, and there are nearly a hundred additional pages. In the new edition are embodied the chief bacteriological conclusions resulting from experience gained in the Great War, and conclusive evidence is afforded of the service of prophylactic vaccination against typhoid fever. The effects of antitetanic and antimeningococcic serums are also considered. Special reference is made to the use of complement-fixation reactions. It is satisfactory to find that a good review is provided of the chief advances made in the new field of chemotherapy. A lengthy chapter of over seventy pages is devoted to the consideration of tuberculin and other special agents in the diagnosis and treatment of tuberculosis. This section alone makes the book indispensable to all tuberculosis officers and other practitioners responsible for the care of tuberculous subjects. An excellent summary is provided of the various forms of tuberculin, their preparation, action, and methods of administration, and there are numerous references to the literature of the subject. We venture to think that this section of the book might be further elaborated and published separately. We should like to suggest that the sections dealing with the dosage of tuberculin should be critically revised. It is satisfactory to find that warnings are given regarding the use of tuber-

<sup>1</sup> "I.K. Therapy. (Immunkörper—Immune Substances) in Pulmonary Tuberculosis." With a summary of cases and 42 illustrative charts. By William Barr, M.D., D.Sc. Glas., D.P.H. Camb., District Tuberculosis Officer for the West Riding of Yorkshire. Pp. 82. Bristol: John Wright and Sons, Ltd. 1916. Price 3s. 6d. net.

<sup>2</sup> "Serums, Vaccines, and Toxins, in Treatment and Diagnosis." By W. Cecil Bosanquet, M.A., M.D. Oxon., F.R.C.P. Lond., Physician to the Charing Cross Hospital and to the Hospital for Consumption and Diseases of the Chest, Brompton; and John W. H. Eyre, M.D., M.S. Dunelm., F.R.S. Edin., Director of the Bacteriological Department of Guy's Hospital, and Lecturer in Bacteriology in the Medical School. Third edition. Pp. viii+456, with illustrations. London: Cassell and Company, Ltd., La Belle Sauvage, E.C. 1916. Price 9s. net.

culin, and the foolishness and injustice of making extravagant claims for it. "Owing, to some extent, to recent legislation, which has brought the care and control of consumptive persons into the hands of the State, much attention has been concentrated on the problems presented by this disease, while the medical supervision of these patients has been entrusted to special officers, many of whom have not previously had any prolonged experience of the affection with which they are called upon to deal. As a result, certain enthusiasts for the use of tuberculin have been able to secure for their views a large and uncritical audience, and the belief has been fostered that in tuberculin we have a remedy which is applicable to a large percentage of all cases of consumption, and which can be relied upon actually to cure this disease. We fear that very grave injury has resulted from this belief. . . . Whatever the cause may be, the number of cases of pulmonary disease in which good results appear to follow the use of tuberculin is so small that it is difficult to be sure that the amount of good done is sufficient to counterbalance the dangers that are inherent in the method. For it is beyond dispute that very great harm may be done by the ill-judged use of tuberculin in consumptive patients. An attack of pleurisy and an acute exacerbation of the disease may be set up by too large a dose, and the progress of the disease may be accelerated by injudicious injections. Indeed, it may be said with some degree of probability that the discovery of tuberculin has resulted in evil rather than good for the sufferers from this form of tuberculosis. In any event, the number of cases suitable for tuberculin treatment is very strictly limited. If tuberculin is to be used at all in the treatment of consumptives—and it would be far preferable to discard it altogether than to admit anything approaching to indiscriminate use of so dangerous a substance—it should be reserved for those who (1) are free from fever; (2) are in good general condition, so as to be capable of reacting satisfactorily in the direction of forming antibodies; and (3) are not making progress under those conditions of fresh air, plentiful diet, and regulated life, which constitute the hygienic treatment of the disease." We have made this somewhat extensive quotation because it says in clear and unequivocal language what needs to be said, and what many tuberculosis officers will do well to consider. We hope that in the next edition the authors will see the wisdom of giving up the use of the designation "tubercular," and coming into line with the best practice in this country and America by employing the more correct word "tuberculous." The work is admirably got up, and there is a satisfactory index.

#### DIET FOR CONSUMPTIVES.

Under the title of "Diet for Consumptives," the Derbyshire County Tuberculosis Committee has issued a practical booklet which will be of real service to tuberculous subjects and those who tend them.<sup>1</sup> It contains notes on the care of the teeth, the ordering of meals, kinds of food, and other helpful suggestions. The chief place is given to specimen meals and a series of recipes and directions for the preparation of food and substitutes for meat. Such a little manual as this would be

<sup>1</sup> "Diet for Consumptives." Specially arranged for the Derbyshire County Tuberculosis Committee. Derby. 1916. Price 2d.

of service in many districts, and we hope it may be possible to publish the brochure in such a form as will make it available in districts other than Derbyshire.

### TUBERCULOSIS AND THE WORK OF FRIENDLY SOCIETIES

Dr. P. C. Varrier-Jones has issued an appeal to Friendly Societies on "Tuberculosis and the Working Man" which merits the thoughtful study of those concerned for the betterment of the working classes.<sup>1</sup> Professor Sims Woodhead commends the author's scheme, and urges that, if it can be adopted by Friendly and other similar Societies in this country, the saving to these Societies, not only in life, but in funds, will be so great that many valuable and additional benefits may be obtained from the present payments, or equal benefits obtained for diminished payments. Dr. Varrier-Jones advocates a modification in the procedure of Friendly Societies whereby greater practical and economic assistance could be given to tuberculous members, particularly in regard to the rational after-care of the consumptive working man when discharged from the sanatorium, whereby there may be opportunity for the continuance of graduated work at home along with a full and suitable dietary. "I advocate that when a man returns from a sanatorium he should be encouraged to resume his former work for short hours, and that during the time he is working short hours, his food allowance should be brought up to the standard he requires." As matters stand, the Friendly Societies by their non-progressive attitude appear to put a premium on idleness, and certainly often accomplish much moral deterioration in a large number of their members.

### SANITATION IN WAR.

Major P. S. Lelean has written a timely and most practical book on sanitation in war, and one which, while of the greatest service to all members of the Royal Army Medical Corps, should be studied by all medicals and sanitarians.<sup>2</sup> The work is based on lectures delivered at the Royal Army Medical College, and provides in concise form and in a particularly attractive and informing manner up-to-date guidance in the facts and governing principles of sanitation on active service. The book consists of nine lectures, dealing respectively with Physical Fitness for War, Anti-Typhoid Inoculation, The March Sickness in the Army, The Role of Insects in War, Medical Organization and Administration in the Field, Field Conservancy, and Water and Water-Supplies. In substance, arrangement, lucidity, and directness of presentation, the manual is exactly what is required to meet the needs

<sup>1</sup> "Tuberculosis and the Working Man: An Appeal to Friendly Societies." By P. C. Varrier-Jones, M.A. Cantab., M.R.C.S., L.R.C.P., late Foundation Scholar of St. John's College, and Acting Tuberculosis Officer, County of Cambridge. With a Preface by G. Sims Woodhead, M.A., M.D., LL.D., Fellow of Trinity Hall, and Professor of Pathology in the University of Cambridge. Pp. 47. Cambridge: W. Heffer and Sons, Ltd. 1916. Price 6d. net.

<sup>2</sup> "Sanitation in War." By Major P. S. Lelean, F.R.C.S., D.P.H., R.A.M.C., Assistant Professor of Hygiene, Royal Army Medical College. With an Introduction by Surgeon-General Sir Alfred Keogh, K.C.B., M.D., F.R.C.P. Pp. vii+267, with diagrammatic frontispiece and 31 figures. London: J. and A. Churchill, 7, Great Marlborough Street. 1915. Price 5s. net.

of the present day, when large numbers of civilian medicals have been suddenly called to undertake duties in connection with military service. The original diagrams add much to the value of the work. It is interesting to note that the author places tuberculosis among fly-borne infections. This book is one which will be of considerable interest and suggestive service to medical superintendents of sanatoria, open-air camps, and the like. It is the most practical and up-to-date manual on war sanitation yet issued.

#### A TUBERCULOSIS DIRECTORY.

The National Association for the Study and Prevention of Tuberculosis in the United States of America is accomplishing much. Perhaps the most striking evidence of its enterprise and far-reaching endeavours is afforded by the new issue of "A Tuberculosis Directory."<sup>1</sup> It is a bulky volume of 420 pages, and is a monumental record of wide-spreading activities. This directory is the fourth of its kind, the first having been issued in 1904. The present edition contains records of more than 3,100 different organizations and institutions. There is hardly a State which has not some form of anti-tuberculosis effort. The American National Association exercises a real leadership. The following summary gives some idea of the progressiveness of our American cousins. There are at the present time the following tuberculosis institutions and associations in the United States: Sanatoria, hospitals, and day-camps for the treatment of tuberculosis, 557; boarding-houses for consumptives in health resorts, 158; hospitals for the insane making special provision for their tuberculous patients, 90; penal institutions making special provision for their tuberculous patients, 35; dispensaries, clinics, and classes for the special treatment of tuberculosis, 455; open-air schools and classes for children, 310; and associations and committees for the study and prevention of tuberculosis, 1,324—making a grand total of 2,929. The section devoted to Canadian institutions is necessarily limited, and reaches only to fourteen pages. We congratulate Dr. C. J. Hatfield, the Executive Secretary of the Association, and Dr. Philip P. Jacobs, the Assistant Secretary, and their coadjutors, on the issue of this invaluable directory.

#### CARDIO-VASCULAR STUDIES.

In many sanatoria too little attention is devoted to a consideration of cardio-vascular conditions. In bygone days the designation "Hospitals for Diseases of the Chest" was popular, but in recent times has to a great extent fallen out of use. This is not altogether wise, for even when the primary trouble is of pulmonary origin, the condition of the heart and intrathoracic vessels and vascular system generally calls for careful consideration. This leads us to advise the study of two valuable works for the clinician, new editions of which have just appeared. Sir Lauder Brunton's manual is based on a course of eight lectures originally delivered in the Physiological Laboratory of the Uni-

<sup>1</sup> "A Tuberculosis Directory," containing a List of Institutions, Associations, and other Agencies dealing with Tuberculosis in the United States and Canada. Compiled by the National Association for the Study and Prevention of Tuberculosis, 105, East Twenty-second Street. 1916.

versity of London, and published under the auspices of the University.<sup>1</sup> The first edition was issued in 1908, and the second edition has been several times reprinted. It is a work which should be in the possession of every practitioner. It admirably supplements the ordinary textbooks. Considerable space is given to physiology, pharmacology, and the pathology of living structures as forming an essential basis for a scientific study of therapeutic processes and procedures. There are excellent sections on methods of examinations and the interpretation of diagnostic features. Something like half the volume is devoted to a consideration of matters relating to treatment. At the end of each chapter is a helpful bibliography, and there is an elaborate general index. There are numerous diagrams, tracings, charts, and other illustrations, which add much to the instructiveness and attractiveness of the book. The other volume to which we desire to draw attention is Dr. E. M. Brockbank's handbook.<sup>2</sup> This well-arranged and thoroughly practical manual was first issued in 1911 under the title "Heart Sounds and Murmurs: Their Causation and Differentiation." The new edition has been considerably revised and extended. It provides an excellent guide to diagnostic methods of cardiac examination, and the newer conceptions relating to such pathological states as premature systole, heart-block, auricular fibrillation, and paroxysmal tachycardia, are lucidly explained. The author continues to maintain his well-known views that the crescendo or so-called presystolic or auricular murmur is early ventricular systolic in rhythm. The value and effectiveness of the handbook is considerably increased by a number of excellent illustrations.

#### MANUALS FOR MEDICAL ADVISERS AND WORKS OF REFERENCE.

Dr. E. M. Magill has prepared a useful practical manual on the employment of electrical procedures in medicine.<sup>3</sup> It has been issued primarily for masseuses preparing for the examinations in medical electricity now held by the Incorporated Society of Trained Masseuses. It is a handbook, however, which will be appreciated by practitioners, nurses, and others responsible for the care and employment of electrical apparatus in sanatoria, hospitals, and nursing homes. In simple, clear, and explicit language, information is presented regarding the use of static or frictional and current electricity in medical work. Descriptions are given of the various batteries and other appliances employed, with explanations of all terms in general use. The volume is divided into three parts, dealing respectively with Galvanism, Faradism

<sup>1</sup> "Therapeutics of the Circulation." By Sir Lauder Brunton, Bart., M.D., D.Sc., LL.D. Edin., LL.D. Aberd., F.R.C.P., F.R.S., Consulting Physician to St. Bartholomew's Hospital. Second edition. Pp. xxiv+536, with illustrations. London: John Murray, 50a, Albemarle Street, W. 1915. Price 5s. net.

<sup>2</sup> "The Diagnosis and Treatment of Heart Disease: Practical Points for Students and Practitioners." By E. M. Brockbank, M.D. Vict., F.R.C.P., Hon. Physician Royal Infirmary, Manchester; Clinical Lecturer on Diseases of the Heart and Dean of Clinical Instruction, University of Manchester. Second edition. Pp. viii+120, with illustrations. London: H. K. Lewis and Co., Ltd., 136, Gower Street, W.C. 1916. Price 3s. 6d. net.

<sup>3</sup> "Notes on Galvanism and Faradism." By E. M. Magill, M.B., B.S. Lond., D.P.H., R.C.S.I. (Hons.). Pp. xvi+220, with 67 illustrations. London: H. K. Lewis and Co., 136, Gower Street, W.C. 1916.

and Currents from the Main. There are good sections on Electric Baths and the Application of Radiant Heat and Light. In the appendix are practical notes, references to the movements of bacteria in relation to an electric current, and the syllabus of the Medical Electricity Examination of the Incorporated Society of Trained Masseuses. The work is well illustrated, and there is a serviceable index.

"New Concepts in Diagnosis and Treatment" is a highly original monograph which has been recently published by Dr. Albert Abrams.<sup>1</sup> It is an erudite, elaborate study of new conceptions, physico-diagnostic and therapeutic methods, and the application of physico-clinical facts to human considerations and needs. The author in his preface makes the following statement: "The laws of physical science are universal, and apply equally to living organisms and so-called inanimate things. This iatro-physical conception demonstrates the trend of unifying the various forms of force under one great principle. Practical medicine embodies all the sciences, and a clinical diagnosis must invoke physical, biological, and chemical methods. The electronic theory demonstrates the electrical nature of matter, and radio-activity is a universal property of the latter. In disease, the rearrangement of the electrons is associated with the evolution of energy endowed with a definite polarity, wave-meter index, and vibratory rate. Inasmuch as electrons are in motion, there is a continual radiation of energy, and the instability of the atom, as expressed by the polarity of my reactions, shows the constant loss of positive or negative, positive and negative, or neutral electrons." Physicians and others of philosophic inclination will find much profit in a study of the Visceral Reflexes of Abrams. In regard to tuberculosis the following appears: "It is generally conceded that the tuberculin reaction is a phenomenon of sensitization. . . . The electronic reaction in tuberculosis yields a neutral dulling energy. One may localize with absolute certainty the site of the lesion, and ascertain its area, whether located in the lung, larynx, lymphatic gland, bone, joint, or other structure. . . . The potentiality of the energy discharge is in direct ratio to the bacterial or toxin content of the lesion. . . . When tuberculosis is generalized, the arteries and veins yield a neutral energy. In a quiescent lesion, the biodynamometer may register only  $\frac{2}{3}$  to  $\frac{5}{5}$  of an ohm, whereas in an active lesion the energy potentiality may equal or exceed 10 ohms. . . . Tuberculous sputum gives the same electronic reaction of tuberculosis. . . . In the light of the pronouncement by Koch in 1901, that the bacillus of bovine tuberculosis did not cause tuberculosis in cattle, it is interesting to observe that the electronic reaction for bovine tuberculosis is identical with that of human tuberculosis." For an elaboration of the author's suggestive views reference must be made to the original monograph.

A suggestive article on Atrophic Rhinitis (Ozæna) and Tuberculosis by Dr. Dan McKenzie, with a communication on the use of

<sup>1</sup> "New Concept in Diagnosis and Treatment: Physico-Clinical Medicine—The Practical Application of the Electronic Theory in the Interpretation and Treatment of Disease, with an Appendix on New Scientific Facts." By Albert Abrams, A.M., LL.D., M.D., F.R.M.S., one-time Professor of Pathology and Director of the Medical Clinic, Cooper Medical College (Department of Medicine, Leland Stanford Junior University, San Francisco, Cal., U.S.A.). Pp. xvii + 335, with 80 illustrations. San Francisco, Cal., U.S.A.: Philopolis Press, Suite 711, St. Paul's Building. 1916, Price \$5.

tuberculin in the disease by Dr. John Mackeith, and a consideration of the pathological aspect of the subject by Dr. Wyatt Wingrave, has been issued in convenient brochure form.<sup>1</sup> The views and records here presented are of much interest and importance, and indicate lines for future research.

Major Basu's manual on the dietetic management of diabetes has now reached a seventh edition.<sup>2</sup> It is based on the view that diabetes is "a manifestation of alimentary toxæmia, and that the increase of sugar in the blood is Nature's antidote of the toxin," and advocates a vegetarian dietary. The monograph is of special interest as indicating opinions and experiences regarding the prevalence and management of diabetes in India.

In these days Britishers' interests are more than ever world-wide. Many will therefore welcome a new edition of Professor W. J. Simpson's handbook on "The Maintenance of Health in the Tropics."<sup>3</sup> It is issued under the auspices of the London School of Tropical Medicine. The first edition appeared in 1905. It provides in well-arranged form and in direct, non-technical language information and direction regarding the prevention of malarial and other affections common in tropical districts, and notes on personal and general hygienic precautions. There are also notes on the management of wounds and suggestions for medical and sanitary equipment. At the present time such a manual as this should be of real service to our men in Egypt, India, Mesopotamia, and elsewhere, in tropical and subtropical regions.

One of the greatest marvels of scientific prophylaxis and sanitary reform is to be found in the wonderful achievements in Panama. A record of these in a form equally acceptable to the professional sanitarian and the thoughtful general reader has just been issued.<sup>4</sup> This volume is one which should be studied in its entirety not only by military and civilian medical officers, but also by every patriotic man and woman eager to lend aid in increasing human happiness and prosperity. The book is a worthy history of the grand work of General Gorgas and his brilliant band of colleagues. The achievement of these scientific pioneers, as Dr. Howard declares in his introduction, has been "an object-lesson for the sanitarians of the world, and has demonstrated the vitally important fact that it is possible for the white race to live healthfully in the tropics." The work is divided into two parts, dealing respectively with the Anti-Malarial and Yellow Fever Campaigns. Details are given of the difficulties of the district, the life-

<sup>1</sup> "Atrophic Rhinitis (Ozæna) and Tuberculosis." Reprinted from *The Journal of Laryngology, Rhinology, and Otology*, May, June, and July, 1916. Pp. 50. London: Adlard and Son and West Newman, Bartholomew Close, E.C.

<sup>2</sup> "The Dietetic Treatment of Diabetes." By B. D. Basu, Major I.M.S. (retired). Seventh edition, revised and enlarged. Pp. ii+105. Allahabad: The Panini Office, Bhuvaneshvari Ashram, Bahadurganj. 1916. Price Rs. 1.8.

<sup>3</sup> "The Maintenance of Health in the Tropics." By W. J. Simpson, C.M.G., M.D., F.R.C.P., Professor of Hygiene and Public Health, King's College, University of London, and Lecturer on Tropical Hygiene at the London School of Tropical Medicine. Pp. xi+174. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1916. Price 3s. 6d. net.

<sup>4</sup> "Mosquito Control in Panama: The Eradication of Malaria and Yellow Fever in Cuba and Panama." By Joseph A. Le Prince, C.E., A.M., Chief Sanitary Inspector, Isthmian Canal Commission, 1904-1914, and A. J. Orenstein, M.D., Assistant Chief Sanitary Inspector, Isthmian Canal Commission. With an Introduction by L. O. Howard, LL.D., Entomologist and Chief, Bureau of Entomology, United States Department of Agriculture. Pp. xvii+335. London and New York: G. P. Putnam's Sons, The Knickerbocker Press. 1916. Price \$2.50. net.

history and habits of the foes to be conquered, the methods and manner of attack, and the adventures which befell in the course of this wonderful warfare. The book is handsomely got-up, and is plentifully supplied with maps, charts, diagrams, and many illustrations. It is a book which might well be sent to British officers serving in the East.

The psycho-physiological effects of noise are well known to every observant medical practitioner, and it is seemly that a member of the healing art should have provided us with "a tirade" on the subject. Dr. McKenzie's monograph on "Din" is worthy of the careful consideration of all medical advisers and every worker for civic progress and human betterment.<sup>1</sup> The book has been written "in the hope of rendering the world we live in quieter, and in that way more habitable." It is a clever, suggestive, and appealing monograph, in which scientific facts, logical arguments, poetic and literary quotations, have been concentrated with much skill and judgment on the common enemy. We venture on one quotation which merits the consideration of open-air enthusiasts: "Too little attention has been hitherto paid by our architects and housewives to the necessity for peace and restfulness in our bedrooms. Within the last quarter of a century we have witnessed a triumphant crusade in favour of the open window, a crusade which some are inclined to believe has been carried to undue lengths. But there is another desideratum, and one which our predecessors understood much better than we do, and that is that bedrooms ought to be both dark and quiet during occupation. The exclusion both of light and of sound renders sleep deeper and more refreshing, since the lower nerve centres of sight and hearing in the brain are thereby permitted to participate in the blessings of rest. Light and sound are both apt to cause dreaming, and dreams always denote imperfect sleep."

A while since we drew attention to Dr. A. E. Shipley's interesting and timely book on "The Minor Horrors of War." The Master of Christ's has now issued a sequel which all medicals should read.<sup>2</sup> It is written with humour and an attractive simplicity which will enable the manual to be understood by all thoughtful men and women. The "horrors," described in a series of fourteen chapters, include Cock-roaches, The Bot- or Warble-Fly, The Mosquito, The Yellow-Fever Mosquito, The Biscuit-Weevil, The Fig-Moth, The Stable-Fly, Rats and the Field-Mouse. There are numerous excellent illustrations.

Professor Peter Thomson is to be congratulated on the handsome volume of "Studies" which he has been able to issue from the Anatomical Department of the University of Birmingham.<sup>3</sup> It contains a description, with elaborate illustrations, of a detailed study of a human embryo of 7 mm., with a number of other communications by workers in the anatomical department of the Birmingham School of Medicine.

<sup>1</sup> "The City of Din: A Tirade against Noise." By Dan McKenzie, M.D. Glasg., F.R.C.S.E. Pp. vi + 115. London: Adlard and Son, Bartholomew Press, Bartholomew Close, E.C. 1916.

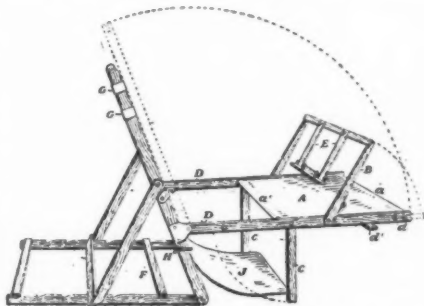
<sup>2</sup> "More Minor Horrors." By A. E. Shipley, Sc.D., Hon. Sc.D. Princeton, F.R.S., Master of Christ's College, Cambridge, and Reader in Zoology in the University. Pp. xiv + 163, with illustrations. London: Smith, Elder and Co., 15, Waterloo Place, 1916. Price 1s. 6d. net.

<sup>3</sup> "Studies in Anatomy from the Anatomical Department of the University of Birmingham." Published by the consent of the University. Edited by Professor Peter Thompson. Pp. 208, with numerous illustrations. Birmingham: Cornish Brothers, Ltd., 39, New Street. 1915. Price 10s. net.

## PREPARATIONS AND APPLIANCES.

### A NOVEL BED-REST.

MR. R. BROOKS-KING, of Widcombe, Taunton, has introduced a new form of bed-rest,<sup>1</sup> which is proving very acceptable in hospitals for our wounded combatants, and will, we believe, be appreciated by bedfast cases in chest hospitals and sanatoria for consumptives. It only needs to be used for its special advantages to be realized. The chief features are indicated in the accompanying figure. The bed-rest is combined with arrangements for bed-table and book-rest. It is strong, light, weighing from eight to nine pounds, and easily adjusted. When not in use it folds up, and occupies but little space. The table and book-rest can be raised out of the way, and clamped above the patient's head. The appliance offers many advantages: There is no objectionable crossbar to press on the lower part of the back; the extension of the canvas, *J*, under the patient is useful in supporting him, and, if not required, can be readily turned back; the canvas material can be easily detached and cleaned. Spare canvas backs are available. The table takes the form of a light detachable tray. Having tested this clever contrivance, we have no hesitation in strongly recommending it.



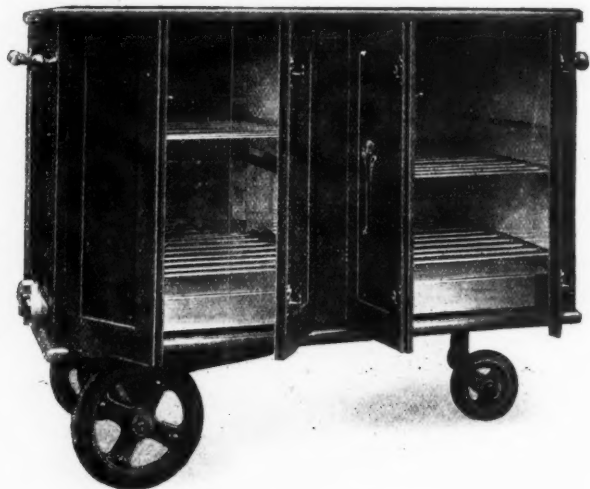
THE BROOKS-KING COMBINATION BED-REST.

### AN ELECTRICALLY HEATED FOOD TROLLEY.

Dr. Sidney Barwise, the County Medical Officer of Health for Derbyshire, writing from the Tuberculosis Department, New County Offices, St. Mary's Gate, Derby, has drawn our attention to the new "FURSE" HOT CUPBOARD. It is being used with great satisfaction at

<sup>1</sup> The Brooks-King Combination Bed-Rest and Bed-Table is supplied complete by Mr. R. Brooks-King, Widcombe, Taunton, at £1 5s. A special rate of 15s. 6d. is at present being allowed to military hospitals.

the Derbyshire Sanatorium.<sup>1</sup> Dr. Barwise writes: "Quite one of the best things that we have at our sanatorium is an electrically heated cupboard. This, of course, is only suitable for sanatoria where there is electrical power. The cupboard has a hot-plate in it, and the whole thing is made hot in the kitchen before the food is put in. It is easily wheeled to the dining-room, and the electrical connection is then made again, so that the food is kept hot during the dinner-time. It is quite the best hot cupboard that I have seen." The cupboard<sup>2</sup> is made of hard wood, highly polished, the front being fitted with two pairs of doors, complete with double bolts and catches. The heating unit is fitted in the bottom, and is designed so that new elements can easily be fitted should necessity arise. Two switches are provided, so that either full or half heat can be used. Between the switches a stout plug is fitted, and the heating unit is connected up to this. The



THE "FURSE" HOT CUPBOARD.

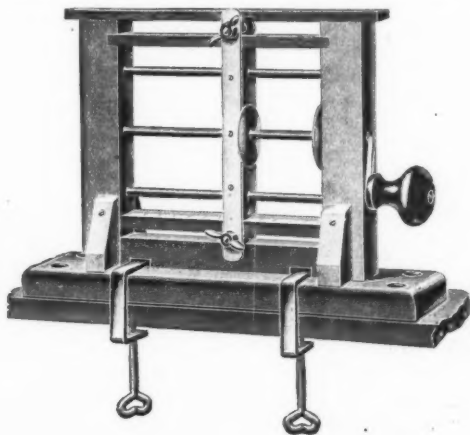
cabinet is lined with polished tin, and between the tin and the woodwork an insulating packing is inserted. A series of movable shelves are fitted, which can easily be raised or lowered to suit. The wheels are rubber-tyred and specially designed, so that the tyres can be easily replaced. A powerful brake can be fitted if required. When once heated, the cupboard will remain at practically the same temperature for an hour. The current consumption is about 2 units per hour. The standard size is 4 feet 6 inches by 2 feet 3 inches by 2 feet high.

<sup>1</sup> A description of the Derbyshire Sanatorium was contributed by Dr. Sidney Barwise to the July issue of THE BRITISH JOURNAL OF TUBERCULOSIS, vol. x., No. 3, p. 126.—EDITOR B. J. T.

<sup>2</sup> The "Furse" Hot Cupboard is manufactured by Messrs. W. J. Furse and Co., Ltd., Traffic Street, Nottingham, and 45, Mayton Street, London, N., and the price is £25.

## REQUISITES FOR THE SANATORIUM AND ITS PATIENTS.

Among the essential appliances for hospitals and sanatoria is an effective bandage winder. One of the best available is the "BRAWOOD" BANDAGE WINDER.<sup>1</sup> Its general form is indicated in the annexed



THE "BRAWOOD" BANDAGE WINDER.

illustration. It is strongly made, easily adjusted, readily clamped in any position, convenient to work, and is being extensively used by the British Red Cross Society.

OSMIQUE DRESSINGS are coming into favour.<sup>2</sup> They have an osmotic action upon wounds, by which the lymph is drawn to the surface, and thereby exercises its remarkable healing properties. For inflammatory conditions, boils, carbuncles, etc., the dressing is applied moist, and will retain its moisture for twenty-four hours if covered with protective. Applied over chronic ulcers, it gives excellent results. It has fully ten times the absorbent properties of ordinary lint or gauze, and is made of compressed cellulose treated with cresol boroid. The latter is highly hygroscopic, and is said to be the only solution of cresol in which soap or potash is not used as a solvent. It contains about 40 per cent. of borax.

The makers of much-used "Oxo" have introduced a novel form of TRENCH OXO HEATER.<sup>3</sup> Each case contains a simple folding metal stand, such as will support a mess-tin, six lighters to supply fuel for

<sup>1</sup> The "Brawood" Bandage Winder is supplied by A. E. Braid and Co., Ltd., 30, Gower Place, Gower Street, London, W.C., price 7s. 6d.

<sup>2</sup> Particulars and specimens of the new Osmique Dressings can be obtained from the makers, A. E. Braid and Co., Ltd., 30, Gower Place, Gower Street, London, W.C.

<sup>3</sup> Particulars and samples of the new Trench Oxo Heater may be obtained on application to Oxo Limited, Thames House, Queen Street Place, London, E.C. The price of each set is 1s.

heating the water, and a tin of six Oxo cubes. It is primarily intended for men at the front, but it should also be of service in connection with first-aid work and open-air management at home.

A new form of all-British Tooth Cream has been introduced under the name of "ZOKA."<sup>1</sup> It is a delicate, refreshing, cleansing agent, possessing deodorizing and antiseptic properties, and is supplied in convenient portable tubes.

"FORMOLYPTOL" is a particularly effective preparation for use in the management of many cases.<sup>2</sup> It is an elegant combination of formaldehyde, aceto-boro-glyceride, and certain active antiseptic balsamic constituents of *pinus pumilio*, *eucalyptus*, *storax*, *benzoin*, and *myrrh*. It is admirable as a nasal douche and mouth-wash, and is often of service in cases of gastro-intestinal fermentation.

Messrs. Allen and Hanbury have introduced a number of new preparations likely to be of service in hospital and sanatorium practice.<sup>3</sup> "ALOPON" is a new sedative and analgesic for general and pre-operative use. It is a brownish powder, soluble in water, and consists of the hydrochlorides of the mixture of alkaloids contained in opium. It is said to be of service in allaying useless cough. "Seroden" is a new colloidal combination of iodine with serum proteins; and as iodine apparently proves of service in not a few cases of tuberculosis, this preparation seems to deserve thorough testing.

TEMPERATURE CHARTS are essential for the equipment of all hospitals and sanatoria and the scientific management of all patients. An effective series, meeting the needs of practically all classes of cases, are issued by Messrs. Wooderspoon and Co. at inexpensive rates.<sup>4</sup> They will be found of service both for institutional cases and patients undergoing domiciliary management.

Motoring has necessarily been restricted by the exigencies of war conditions, but it is to be hoped that the hygienic and educational advantages of motor-touring will not be indefinitely restricted. Now that foreign travel will be out of the question for a long time to come, Britishers will be compelled to secure the necessary relaxation and recreation essential to the maintenance of health by becoming better acquainted with the beauties and benefits of their own land. As an aid to this desirable end, we would draw attention to the admirable "New Michelin Map of the British Isles." This is being issued in a series of sheets, twenty-three of which are now available. The map is engraved and printed in six colours, and affords direction regarding character of road surface, gradients, dangerous corners, railways, level-crossings, roads to be avoided, golf links, race-courses, etc., as well as giving the

<sup>1</sup> "Zoka" Tooth Cream is supplied by the White Band Manufacturing Company, Ltd., Selsdon Road, Croydon, Surrey, in tubes at 6d. and 1s.

<sup>2</sup> "Formolyptol" is manufactured by Messrs. Andrus and Andrus, and specimens and full particulars can be obtained on application to Messrs. John Morgan Richards and Sons, Ltd., 46, 47, Holborn Viaduct, London, E.C.

<sup>3</sup> Specimens and particulars of Allen and Hanbury's new preparations can be obtained on application to their City House, 37, Lombard Street, London, E.C.; or the West End Centre, 7, Vere Street, Cavendish Square, London, W.

<sup>4</sup> Specimens and particulars can be obtained on application to Messrs. Wooderspoon and Co., 6, Gate Street, Kingsway, London, W.C.

chief geographical features of the countryside. Each map can be conveniently folded, so that sections can be examined without unfolding the whole. It should be noted that the scale is 1 in 200,000, or 3.15 miles to the inch. . We have nothing but praise for these excellent maps.<sup>1</sup>

In the designing and construction of BLINDS FOR ROOMS AND WARDS there is now much room for originality and ingenuity. Not only in dwelling-houses, schools, churches, works, and other private and public buildings, but in nursing-homes, hospitals, sanatoria, and other places devoted to the care of the delicate and sick, considerable difficulties have been experienced in meeting demands necessary for the defence of the realm, and at the same time effectively maintaining conditions essential for comfort and hygienic well-being. In connection with open-air management during winter months the perplexities arising from the need for securing proper darkening have been great. Many serviceable contrivances in the way of blinds and protective appliances have been introduced. We are anxious to bring these to the notice of those likely to be advantaged by their adoption. It is hoped that particulars may be sent us at once of all blinds, screens, protectors for light, and like contrivances, which are likely to prove of service in hospitals and sanatoria during the dark days of winter.

<sup>1</sup> The New Michelin Map of the British Isles is to be completed in thirty-one sheets, and is published at the Touring Office of the Michelin Tyre Company, Ltd., 81, Fulham Road, Chelsea, London, S.W. Price, paper, 1s. ; canvas mounted, 2s., or post free, 2s. 1½d.

## THE OUTLOOK.

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### THE BRITISH JOURNAL OF TUBERCULOSIS, VOL. X.

THE BRITISH JOURNAL OF TUBERCULOSIS with this number completes its tenth volume. During the past decade marked advance has been made, not only in regard to our knowledge regarding tuberculosis, but in the organization and administration of measures for its prevention, arrest, and amelioration. The Great War has, however, added greatly to the difficulties of the tuberculosis campaign. It is evident, however, that the nation cannot afford to be forgetful of the enemy within its own domains. Conditions are now at work which it is feared will inevitably lead to an increase in the prevalence of tuberculosis. Considerable numbers of combatants are breaking down with the disease. Workers in munition and other factories are being subjected to exceptional strain, and exposed to influences known to predispose to tuberculosis. Large numbers of children and youths have had to undertake indoor occupations. In many districts overcrowding of habitations has increased. Although the men on active service are benefiting from an open-air life, it must be remembered that the conditions of existence at home necessitate, at least during winter months, an indoor life, with less of light and air than are essential for a high standard of health. It seems probable that the difficulties of maintaining hygienic and anti-tuberculosis influences after the war will increase rather than diminish. It is evident to all experienced workers that a scientific outlook and a truly statesmanlike prescience is essential if wise steps are to be taken to safeguard the future. This Journal will maintain its aim to provide a responsible organ for the record of all forms of work relating to the tuberculosis problem, and we shall endeavour to continue to present a reliable review of all views, experiments, enterprises, and accomplishments, which further knowledge of tuberculosis and may lead to its extermination. We therefore earnestly invite the co-operation of all interested in the work. Suggestions of every kind are always welcome. It is hoped that medical officers of health, tuberculosis officers, superintendents of sanatoria, and all others engaged in any form of work bearing on the tuberculosis problem, will favour us with copies of their reports or other publications as soon as issued. We trust also that our readers will do their utmost to bring the Journal before the notice of all likely to be interested in and willing to support the cause it seeks to serve.

### THE NATIONAL ASSOCIATION FOR THE PREVENTION OF CONSUMPTION.

The seventeenth annual general meeting of the National Association for the Prevention of Consumption and Other Forms of Tuberculosis was held at 20, Hanover Square, London, on July 26. The annual report presented records of the results achieved by the caravan tours

through various districts and towns both in the north and the south. The Association has been active in the interests of the tuberculous soldier. Much has been done to provide appropriate treatment for cases, but, in spite of official denials, their number is said far to exceed the available resources. A strong representation has been made to the War Office authorities with a view to postponing discharge from the army on account of tuberculosis until after a period of treatment has been tried. Immediate discharge involves loss of the separation allowance just at the time when it is most wanted: there is reason to believe that the proposition for postponement will be favourably entertained. With a view to the prevention of enlistment of persons suffering from latent tuberculosis, a system of notification by medical officers of health of all persons of military age has been started, and should have the result of greatly reducing the number of actual or potential consumptives in the army. Sir William Osler read a paper on the tuberculous soldier. He suggested (1) that searching examination should be made of recruits, doubtful cases being referred to the tuberculosis expert of the district; (2) that army experts should decide on doubtful cases before discharge; and (3) that a national organization should look after the welfare of the tuberculous soldier, with subsidiary branches in each county, and that this work should be done in co-operation with societies for the after-care of sailors and soldiers.

#### KING EDWARD VII. WELSH NATIONAL MEMORIAL ASSOCIATION.

The Board of Governors of the Welsh National Memorial Association for the Prevention and Abolition of Consumption held their annual meeting on July 29. Ten out of the twenty-seven medical officers are away on military service, but substantial increases have occurred in the numbers of patients examined, treated in sanatoria, and admitted to hospitals. The funds of the Association are derived from the County and Borough Councils of Wales, the (Welsh) National Insurance Commission, the Treasury, and other sources. Mr. D. S. Davies, late High Sheriff of Denbighshire, has promised to defray the cost—estimated at £2,285—of the projected surgical block of the North Wales Sanatorium at Llangwyfan; but the scheme has had to be suspended until after the war, although plans have been drawn up and approved by the Welsh Insurance Commissioners. The sum of £1,000 has been presented jointly by the three Messrs. Griffiths Brothers, of Newport, to pay for the alteration and equipment of Cardigan House, Newport, which was presented by Sir Garrod Thomas and members of his family. It was proposed to establish a hospital for surgical tuberculosis in children. The projected hospital at Pontypool Road, on land given to the Association by Mr. J. C. Hanbury, is stopped; but contracts for six hospitals and sanatoria entered into before the Treasury restrictions became operative are, however, to proceed if labour difficulties can be overcome. The extensions at the Glan Ely Hospital, near Cardiff, and the hospital at Llangefni, have been completed and opened for the reception of patients. It is hoped that the sanatorium at Llangwyfan (the surgical block excepted) will be ready speedily for the reception of a hundred patients. The sanatorium at

Talgarth is completed as far as the main buildings are concerned. The hospital at Tregaron is nearing completion. Every local authority in Wales seems to have "come in" under the National Memorial Association, except the County Councils of Breconshire and Pembroke-shire. A supplemental charter has been adopted by the Memorial Association, after approval by the Treasury and the Welsh Insurance Commissioners. Its object is to effect an administrative change in the Association—namely, to alter the statutes which make the secretary the chief administrative officer, thus paving the way for a reorganization which four years' experience of the work has shown to be necessary in the medical as well as the administrative departments. Medical officers connected with the Association are of opinion that its work is retarded by an excessive amount of lay control. The medical director, Dr. Marcus Paterson, is stationed at Alltymynydd Sanatorium at Llanybyther, which is remote from the centre at Cardiff. The Association now proposes to define clearly the duties of Mr. D. W. Evans, the general director, and Mr. Gwilym Hughes, the secretary. The report is a record of steady progress.<sup>1</sup>

#### NOTES AND RECORDS.

The problem of tuberculosis in relation to public health receives special consideration in Part III. of the Forty-fourth Annual Report of the Local Government Board.<sup>2</sup> The report contains various statistical statements in tabular form regarding schemes for institutional treatment of tuberculosis, the expenditure involved, and returns of cases notified.

Dr. Lane-Clayton, in her recently published and very complete book on "Milk and its Hygienic Relations,"<sup>3</sup> furnishes a valuable summary of our present knowledge regarding the presence of tubercle bacilli in milk. The subject is discussed under the headings: (1) The presence of tubercle bacilli in milk, with an attempt to show their relative prevalence in milk samples and in milking cows; and (2) the connection between the presence of the bacilli in milk and the health of children.

Sir George Newman, in his recently issued Report for 1915, deals with the prevalence of tuberculosis in school-children, and furnishes lists of day schools for children suffering with pulmonary tuberculosis, and residential sanatorium schools for children the subjects of tuberculosis of the lungs, and also surgical tuberculosis.<sup>4</sup>

<sup>1</sup> Fourth Annual Report of the King Edward VII. Welsh National Memorial Association for the year ended March 31, 1916. Published by the Educational Publishing Company, Ltd., Penarth Road, Cardiff.

<sup>2</sup> Forty-fourth Annual Report of the Local Government Board, 1914-1915. Part III.: (a) Public Health and Local Administration; (b) County Council Administration; (c) Local Taxation and Valuation. Pp. 127. [Cd. 8197.] London: Wyman and Sons, Ltd., 29, Bream's Buildings, Fetter Lane, E.C. 1916. Price 6d.

<sup>3</sup> "Milk and its Hygienic Relations." By Janet E. Lane-Clayton, M.D., D.Sc. (Lond.), Assistant Medical Inspector under the Local Government Board. Pp. viii + 348, with 8 plates and diagrams in the text. Published under the direction of the Medical Research Committee (National Health Insurance). London: Longmans, Green and Co., Ltd., 39, Paternoster Row, E.C. 1916. Price 7s. 6d. net.

<sup>4</sup> Annual Report for 1915 of the Chief Medical Officer of the Board of Education. [Cd. 8338.] London: Wyman and Sons, Ltd., 29, Bream's Buildings, Fetter Lane, E.C. 1916. Price 9d.

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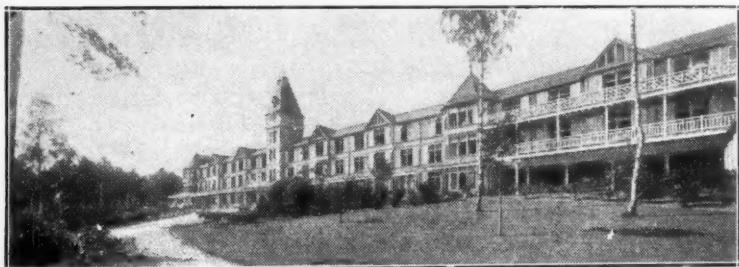
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